K. L. E. Society's
P. C. JABIN SCIENCE COLLEGE
Autonomous Vidyanagar, Hubballi - 31
CPE Phase - III
Re-Accredired by NAAC at 'A' Level with CGPA 3.43
MHRD-UBA-2.0 & IIC

STUDENTS' HAND BOOK

FOR
B.Sc. I & II SEMESTER

2022-23

Name : _____

Class : _____ Division : _____ Reg No. : _____

STAFF LIST - 2022-23

PRINCIPAL

Dr. L. D. Horakeri, Associate Professor Physics & I/C Principal

DEPARTMENT OF PHYSICS

1 Shri S. V. Angadi Associate Prof.
2 Smt. L. C. Shidaganal Associate Prof.
3 Dr. Jagadeesha Angadi V. Assistant Prof.
4 Shri Veeresh G. Hiremath Assistant Prof.
5 Miss. Medha Deshpande Assistant Prof.
6 Dr. Rajesh Nairy K. Assistant Prof.
7 Dr. Veena E. Assistant Prof.
8 Smt. Sheela Gandhad, Lecturer

DEPARTMENT OF CHEMISTRY

1 Dr. S. B. Koujalgi Associate Prof.
2 Shri. V. P. Goankar Associate Prof.
3 Dr. Shivakumar S. Toragalmath Assistant Prof.
4 Dr. Mahantesh M. Assistant Prof.
5 Dr. Prakash K. C. Assistant Prof.
6 Smt. Suma J. G. Assistant Prof.
7 Miss. Afra Quasar Nadaf Assistant Prof.
8 Shri Vinayak Chandrappa Barangi Assistant Prof.
9 Dr. (Smt). Padmeshewary R. Assistant Prof.
11 Shri Pavankumar H. Assistant Prof.
11 Miss. Roopali Chonchannavvar Lecturer

DEPARTMENT OF MATHEMATICS

1 Dr. Rudraswamy N. G. Assistant Prof.
2 Dr. (Smt). Vidyavathi K. R. Assistant Prof.
3 Smt. Ashma F. Ganachari Assistant Prof.
4 Smt. Ganganmma Mokashi Lecturer
5 Smt. Vidya Pattanshetti Lecturer
6 Dr. Pallavi Mirajkar Lecturer
7 Miss. Pavitra Korishettar, Lecturer
8 Miss. Suvarna Jodatti, Lecturer

DEPARTMENT OF BOTANY

1 Dr. E. B. Sedamkar Associate Prof.
2 Shri Dheerendra Vadhiraj Assistant Prof.
3 Dr. (Smt). Shweta Jayavant Sabannavar Assistant Prof.
4 Smt. Geeta Bindali Lecturer
5 Miss. Baby Benasamati Lecturer

DEPARTMENT OF ZOOLOGY

1 Dr.(smt) Sudha Patil Assistant Prof.
2 Smt. Sumangala B. Patil Assistant Prof.
3 Miss. Kiran V. Gargi Lecturer
4 Miss. Soumay Kundgol, Lecturer
5 Miss. Nisha Hosur Lecturer

DEPARTMENT OF STATISTICS

1 Dr. C. C. Math Associate Prof.
2 Shri B. Venkateshwar Lecturer
3 Miss. Shruti Hiremath Lecturer

DEPARTMENT OF ELECTRONICS

1 Shri R. P. Mudenurmath Lecturer
2 Shri M. S. Sethsanadi Lecturer
3 Smt. Revati Poonja Lecturer
4 Shri Naveenrudda H. Tiligal Lecturer

DEPARTMENT OF BIOTECHNOLOGY & MICROBIOLOGY

1 Smt. Geetanjali Kamble Lecturer
2 Dr. Gurusiddesh Hiremath Lecturer
3 Smt. Aishwarya Y. Ladwa, Lecturer
4 Dr. Sneha Chinnata, Lecturer
5 Dr. Jayaraj Chinchali Lecturer
6 Smt. Shruti M. Hugar, Lecturer

DEPARTMENT OF COMPUTER SCIENCE

1 Shri Vikas Tuwar Lecturer
2 Miss. Deepa Sonar Lecturer

DEPARTMENT OF ENGLISH

1 Dr. M. Y. Molekar, HOD
2 Dr. G. G. Patil, Assistant Professor

DEPARTMENT OF KANNADA

1 Smt. Anasuya Y. T., HOD
2 Miss. M. S. Jayshree Lagammanavar Lecturer

DEPARTMENT OF HINDI

1 Shri. S. A. Patil HOD

DEPARTMENT OF LIBRARY

1 Smt. Vijayalaxmi A. Shivanigi Librarian

SPORTS

1 Shir Prabhakarna T. Assistant Professor

NON-TECHING STAF

1. Shri Shreedar Chegaraddi, FDA
2. Shri N. C. Itagi, Superintendent
3. Smt. Rajani S. Nayak, FDA
4. Shri B. N. Jamakandi, SDA
5. Shri Mahaveer N. Devalapur, SDA
6. Shri M. S. Hiremeth, Lab Asst.
7. Shri S. M. Hospeti, Lab Asst.

EXAMINATION SECTION

1. Dr. L. D. Horakeri Principal
2. Shri Dheerendra V. Vadiraj, Controller of Examition
3. Miss. Lata Ichageri, F.D.A.
4. Miss. Shilpa Kallimani, FDA

PLACEMENT OFFICER

1 Smt. Sneha Sapare

KLE SOCIETY'S

P. C. JABIN SCIENCE COLLEGE,

AUTONOMOUS, CPE PHASE -III

AFFILIATED TO KARNATAK UNIVERSITY DHARWAD
APPROVED BY UNIVERSITY GRANTS COMMISSION, NEW DELHI AND GOVERNMENT OF KARNATAKA

Accredited at 'A' Grade by NAAC

VIDYANAGAR, HUBBALLI-580031

K.L.E Society's P. C. Jabin Science College Hubballi.

CALENDAR OF EVENTS FOR THE YEAR 2022-23 FOR B.Sc. / BCA *II, IV, & VI* SEMESTERS

MONTHS	WEEKS	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	NO OF WORKING DAYS	EVENTS
APR/MAY	I	09	10	11	12	13	14	15	05	COLLEGE REOPEN ON 10TH APRIL 14/04/23 DR. Ambedkar Jayanti VI SEMESTER CLASSES COMMENCES
	II	16	17	18	19	20	21	22	05	22/04/23 Idul Fitar 17/04/2023, II & IV SEMESTER CLASSES COMMENCES
	III	23	24	25	26	27	28	29	06	
	IV	30	01	02	03	04	05	06	05	01/05/23 **Labor's Day Week of Parent- teacher Meet**
	V	07	08	09	10	11	12	13	06	Week of B.O.S Meetings.
MAY/JUN	VI	14	15	16	17	18	19	20	06	Display of attendance report Department wise
	VII	21	22	23	24	25	26	27	06	**C1-Week of First IA Test**
	VIII	28	29	30	31	01	02	03	06	
	IX	04	05	06	07	08	09	10	06	
	X	11	12	13	14	15	16	17	06	Display of attendance report Department wise
JUN/JULY	XI	18	19	20	21	22	23	24	06	**C2-Week of Surprise Test**
	XII	25	26	27	28	29	30	01	05	29/06/23 Bakarid BOAE / BOE Meeting Submission of Panel of Examiners.
	XIII	02	03	04	05	06	07	08	06	**Week of Makeup Test** **Order to Examiners to set the Question paper**
	XIV	09	10	11	12	13	14	15	06	**C3-Completion of IIIrd Component.** **WEEK OF INTERNAL PRACTICALS**
JUL/AUG	XV	16	17	18	19	20	21	22	06	Week of Display of SEE Time table Week of submission of Exam application
	XVI	23	24	25	6	27	28	29	05	29/07/23 Moharum SUBMISSION OF CIA MARKS
	XVII	30	31	01	02	03	04	05	06	Display of attendance report Department wise 5th AUG is the last working day
TOTAL NUMBER OF WORKING DAYS									97	

- *Conduct of Assignments/ Viva/Seminars etc is as per the respective Department Calendar of events.*
- *Vacation: From 06/08/2023 to 24/09/2023.*
- *Semester end Practical Examination 08/08/2023 on wards.*
- *Semester end Theory Examination from 01/09/2023.on wards.*
- *Declaration of results 28/09/2023.*
- *Reschedule of events if any emergency holidays.*
- *College reopens on 25/09/2023.*

Principal
K. L. E. Society's P. C. Jabin Science College
Vidyanagar, Hubballi.
Karnataka - 580031.

Academic Calender of Events
2022-23

DEPARTMENT	September	October	November	December	January	February
PHYSICS	1.Bridge course for 1st sem students	1.Capacity building program 2.Display of teaching plan and lesson plan 3. Value added / certificate course enrollment	1.Study visit 2. Gender equity program 3.1st IA .	1.Guest Lecture 2. Extension activity 3. Peer tutoring 4.Study visit 5. 2nd IA	1.College level competitions 2. Make up test	1.Guest Lecture 2. Online International seminar / Conference
MATHS		1.Display of Teaching plan & lesson plan 2.Value added/certificate course enrollment	1.Faculty exchange programme 2.BOS meeting 3.Guest lecture 4.Display of attendance 5.1st IA 6.Students seminar	1.Workshop on JAM/Gate 2.Display of attendance 3.BOE meeting 4. 2nd IA 5.Quiz strife - 3	1. Make up test 2.Display of attendance 3.Display of consolidated marks	1.Submission of CIA marks 2.Curriculum feedback & analysis
CHEMISTRY	Bridge Course for Sem -1	1. Bridge Course for Sem -1. 2. Orientation Program for Sem -1. 3.BOS Meeting. 4. Display of Teaching plan & Lesson Plan. 5.Value added / CertificateCourse enrollment 6. Coaching for JAM/PGCET/other competitive exams	1. Selection of association secretaries. 2. Inauguration of chemical society. 3. Guest Lecture. 4. Display of attendance 5. 1st IA	1. Program for advanced learners. 2. Program for slow learners. 3.Display of Attandence 4. BOE meeting 5. 2nd IA	1. Industrial visits/Field visits/ Survey. 2. Make-up test 3.Extension activities 4. Display of attendance 5. Practical IA 6. Display of consolidated marks.	1. Submission of CIA marks. 2. Curriculim feedback analysis. 3. FDP

ZOOLOGY	1.Ozone day awareness programme	1.World animal welfare week celebration 2.Display of teachingplan & lesson plan 3.Value added /certificate course enrolment 4.Faculty development programme	1.Faculty exchange program. 2.BOS meeting 3Faculty exchange progeam 3.Displayof attendance 4. 1st IA	1.National pollution preventation Day 2.Display of attendance 3.BOE meeting 4. 2nd IA	1. Makeup test 2.Display of attendance 3.Display of conosolidated marks	1.Submission of CIA marks 2.Curriculum feedback& analysis
BOTANY		1.Departmental activities. 2.World Food Day(competition on food) 3.BoS meeting	1.Guest Lecture 2.V sem industrial visit		1.Guest Lecture	1.Field visit for BSc 1st, Vth & V1 th sem students
STATISTICS		1.Induction/Orientation programme. 2. Display of Teaching plan & Lesson Plan. 3. Value added / Certificate Course enrollment. 4. FDP on curriculum development.	1. Seminar /Workshop 2. BOS meeting. 3. Display of attendance. 4. Industrial visits/Field visits 5. 1st IA	1. Capacity development/ Skill enhancement activity. 2. Student /Faculty Exchange programme. 3. Displayof attendance 4. BoE meeting 5. 2nd IA	1. Extension activity 2. Makeup test. 3. Seminar / Workshop. 4. Display of attendance 5. Display of consolidated marks.	1. Submission of CIA. 2. Curriculum feedback & analysis.
ELECTRONICS			1.Technical talk	1. Association activity 2. Industry visit for students. 3.Enrichment program	1.Value added course commencement	1. Association activity

COMP-SCIENCE	1. Workshop 2. Quiz competition	1. Paper presentation. 2. Department Extension activity	1. Seminar 2. FDP		1.Technical talkon upcoming technology like AI/ Machine learning/IoT/ Ghat GPT 2. Project Domain& report. 3. Workshop for BSC VI sem.	1. Guest Lecture 2. FDP
BIOTECHNOLOGY/ MICROBIOLOGY		1. Workshop. 2.Career guidance -18th Oct,2022	1.Food fest 2.Guest lecture – world Diabetes DAy -14th Nov,2022	1.Industrial visit		1.National Science Day -28th Feb,2023 2. Model Making
PLACEMENT	1. Employable aptitude training 2.SAP LAB & Wipro campus drive	1. Employable aptitude training / Industry academia Collaboration 2.SAP LAB campus drive 3. Wipro campus drive	1.Atos off campus drive 2.Mindtree campus drive 3.Accenture campus drive 4.TCS campus drive	1.TCS campus drive	1.Nestle campus drive 2.Hexaware campus drive	
LIBRARY	1. Library Orientation Programme. 2.Conducting orientation on e-resources to PG students	1.Inviting an author from local area. 2.Enhancing reading skills among students	Talk on Competitive Exam. Talk on our Library E-resources	Talk on Collection of E-resources	Guest Lecture	----------
KANNADA	Guest Lecture for students	Organising various competitions for students	Organising various guest lectures for students	Organizing field visits for students	----------	----------
ENGLISH		1.BoS meeting 2.Display of	1.Inaugraution of Department Association	1.Capacity Development program	1.Intercollege competition for	1. Submission of CIA marks.

		teaching plan & lesson plan 3. Value added/ certificate course enrolment	Activities 2. Guest Lecture 3.Program on Gender equality and Women empowerment . 4.Display of attendance 5 .1st IA	2.Competition for students 3. 3.Display of attendance 4. 2nd IA 5. FDP	students 2.Make –up test 3. Display of attendance 4.Workshop 5. Display of consolidated marks	2.Curriculum feedback and analysis.
HINDI		1.BoS meeting 2.Display of teaching plan & lesson plan	1.Inaugrautionof Department Association Activities 2.Display of attendance 3.1st IA	1.Guest Lecture 2.Competition for students 3.Display of attendance 2. 2nd IA	1. Make-up test 2. Display of attendance 3. Display of consolidated marks	1.Submission of CIA marks 2.Curriculum feedback and analysis.

Department	**March**	**April**	**May**	**June**	**July**	**August**
Physics		1. Capabilty building program 2.Online National Seminar 3.Study visit 4. Organization of seminar	1. College level competitions 2. 1st IA 3.Guest lecture 4.Peer tutoring 5. FDP on curricular design 6. Outreach program	1. 2nd IA 2.Guest Lecture 3. Online National level seminar 4. Makeup test	1. Quiz competitions .	.
Maths	1.Submission of documents to IQAC	1.BOS Meeting 2.Poster presentation	1.Display of attendance 2.1st IA 3.Math exhibition	1.Display of attendance 2.BOE meeting 3.2nd IA	1.Guest lecture 2.Display of consolidated marks 3.Submission of CIA	1.Submission of documents to IQAC

			4.Faculty exchange programme	4.Makeup test	marks 4.Curriculum feedback &analysis 5.Natonal conference	
Chemistry	1.Submission of documents to IQAC 2. BOS meeting	1. Departmental competitions. 2.State level conference	1. Display of attendance 2. 1st IA 3.Programme for advanced learners Programme for slow learners	1.Display of attendance 2.BOE meeting 3. 2nd IA 4.Industry visit/field visit/survey 5.Makeup test Coaching for JAM/PGCET/other competitive examination	1.Extension activities 2. Practical IA 2.Display of consolidated marks 3.Submission of CIA marks 4.validctoryof chemical society 5.Workshop for students 6.curiiculum feedback & analysis	1. FDP 2.Submission of documents to IQAC
Zoology	1.Submission of CIA marks	1.World Health day 2.Natonal seminar 3.Faculty development program 4. BoS meeting	1.Display of attendance 2.1st IA	1.Dispaly of attendance 2.BoS meeting 3.World food safety day 4. 2nd IA 5. Makeup test	1.Diaplay of consoidated marks 2.Submission of CIA Marks. 3. Curriculum feedback & analysis	1.Submission of documents to IQAC
Botany	1.SEE	1.Project assignment	1. Association activity. 2.Mini project assignment	1.Guest Lecture	1. Article writing competition	1. Project exhibition 2.FDP 3.SEE
Electronics	Project /Mini project assignment	Industry visit for Final year students	Exhibition	Lab demonstration to junior students to senior students	1.) Guest lecture. 2.)Association activities	Seminar/conference /Workshop /FDP
Computer Science	1. Hands on training on Android apps Development					
BIOTECHNOLOGY/ MICROBIOLOGY	1.Workshop related to career guidance	1. Workshop on – Laboratory safety and waste management	1.World Biological Diversity DAy – 22 May 2023 –	1.27th June, Celebration of the Microbial		

			Photography competition	world - competition		
PLACEMENT	1.L & T campus drive 2.Federal Bank campus drive 3.E & Y	1.Soft skill training 2.TCS Campus BPS drive/Employable 3.Q Spider campus drive	1.Seminar on how to face UPSE 2.Shilpa medicare campus drive/Employable aptitude training 3.Guest Lecture/ employabelaptitude training 4.Workshop on grooming	1. HCL Campus drive/ Employable aptitude training 2.IBM Campus drive 3.Global Foundaries campus drive/ Employable aptitude training 4. BYJUS campus drive		
Library	Celebrating world book day.	Guest Lecture on NLIST	Book Exhibition on Environmental Day.	Workshop on DEINET & NLIST resources.	Celebration of Library week & Guest Lecture.	Seminar on Plagirasim
Kannada	Organising various competitions for students	Organising various guest lectures for students	Organizing field visits students	Conducting skill development programmes	Organising FDP programmes for faculties and students	
English	1.Submission of documents to IQAC 2.Extension activity	1. Program on Gender equality and Women empowerment . 2. BoS meeting 3.Celebration of English language Day	1.Display of attendance 2. 1st IA 3. Capacity development program 4. Guest lecture	1.Display of attendance 2. BoE meeting 3. 2nd IA 4. FDP Competition for students 5. Make up test	1.Extension Activities 2.Displayof consolidated marks 3.Submission of CIA Marks 4.Ciriculumfeedback & Analysis Seminar/Seminar competition	1. Workshop 2. Submission of documents to IQAC 3. Conference
Hindi	1.Submission of documents to IQAC	1.Value added/ certificate course enrolment 2. BoS meeting	1.Display of attendance 2. 1st IA 3. Guest lecture	1.Display of attendance 2. BoE meeting 3. 2nd IA 4. Competition for students 5.Make-up test	1.Diaplay of consoidated marks 2. submission of CIA marks 3. Curriculum feedback & analysis	1.Submission of documents to IQAC

DEPARTMENT OF KANNADA

Autonomous, Cpe Phase -III
Affiliated to Karnatak University Dharwad
Approved By University Grants Commission, New Delhi and
Government of Karnataka

Semester - I NEP

ಕನ್ನಡ ವಿಭಾಗ

Course Title	L1-1-ಕನ್ನಡ ಭಾಷಾ ಪಠ್ಯ–ವರದಾ	CIA Marks	40
Course Code	111AECC1	CIA Marks	40
Scheme (L:T:P)	4:0:0	Credits	3
Teaching Hours	48	Examination Hours	3

Course objectives: This course (111AECC1) will enable the students to

- ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ನಾಡು– ನುಡಿಯ ಸೇವೆಯು ಬದುಕಿನ ಅವಿಭಾಜ್ಯ ಅಂಗ ಎಂಬುದನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಾಹಿತ್ಯದ ಮೂಲಕ ಸದೃಢವಾದ ಬೌದ್ಧಿಕ ವ್ಯಕ್ತಿತ್ವವನ್ನು ಮೈಗೂಡಿಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಭಾಷಾ ಕೌಶಲ್ಯಗಳಲ್ಲಿ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೊಂದುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಮಕಾಲಿನ ವಿದ್ಯಮಾನಗಳ ಅರಿವನ್ನು ಮೂಡಿಸಿಕೊಳ್ಳುವರು.

Course Outcome: After successfully completion of the course, student are able to;

- 111AECC1.1 ಸಾಹಿತ್ಯದ ಓದು, ತಿಳುವಳಿಕೆ ಹಾಗೂ ಬರವಣಿಗೆಯನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುವುದು.
- 111AECC1.2 ನಾಡು–ನುಡಿಯನ್ನು ಕುರಿತು ಅರಿವನ್ನು ಹೆಚ್ಚಿಸಿಕೊಳ್ಳುವುದು.
- 111AECC1.3 ಸಮಕಾಲಿನ ವಿದ್ಯಮಾನಗಳ ಹಾಗೂ ಸಾಮಾಜಿಕ ಹೊಣೆಗಾರಿಕೆಯ ಅರಿವು.
- 111AECC1.4 ಸದೃಢ ಬೌದ್ಧಿಕ ವ್ಯಕ್ತಿತ್ವದ ಅರಿವು.
- CO 5 ಭಾಷಾ ಕೌಶಲ್ಯವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು.

Mapping of CO with PO

CO	PO									
	1	2	3	4	5	6	7	8	9	10
111AECC1.1						3				
111AECC1.2						3				
111AECC1.3						3				
111AECC1.4						3				

Course Content :

ಘಟಕ –1: ಕನ್ನಡ ನಾಡು–ನುಡಿ–ಚಿಂತನೆ

1. ಕನ್ನಡ ದಾಸಯ್ಯ : ಶಾಂತಕವಿ
2. ನಾಡಿಗೂ ನುಡಿಗೂ ಸಂಬಂಧ : ದ.ರಾ.ಬೇಂದ್ರೆ (ಲೇಖನ)
3. ಕನ್ನಡ ಪದಗೊಳ್ : ಜಿ.ಪಿ.ರಾಜರತ್ನಂ (ಕವಿತೆ)
4. ವಚನಗಳು : ಜಯದೇವಿ ತಾಯಿ ಲಿಗಾಡೆ

ಘಟಕ–2 : ವಿಜ್ಞಾನ ಮತ್ತು ಸಾಹಿತ್ಯ

1. ವೈಜ್ಞಾನಿಕ ದೃಷ್ಟಿ : ಸರ್ ಸಿ.ವಿ. ರಾಮನ್
2. ವಿಜ್ಞಾನದ ನೈತಿಕ ಮುಖಗಳು : ಬಿ.ಸಿ. ರಾಯ್
3. ಜನಪದ ಕಾವ್ಯದ ಆಯ್ದ ಭಾಗಗಳು
4. ಕಾಡತೊರೆಯ ಜಾಡು : ಕಡಿದಾಳು ಶಾಮಣ್ಣ ಆತ್ಮಚರಿತ್ರೆಯ ಭಾಗ
5. ಕೆಂಪು ಗಿಳಿ : ವಸುಧೇಂದ್ರ

ಘಟಕ –3. ವೈಜ್ಞಾನಿಕ ಮನೋಧರ್ಮ

1. ಸರ್ವಜ್ಞನ ತ್ರಿಪದಿಗಳು : ಆಯ್ದ ಐದು.
2. ಜ್ಯೋತಿಷ್ಯ ಅರ್ಥಪೂರ್ಣವೋ ಅರ್ಥ ರಹಿತವೋ : ಎಚ್.ನರಸಿಂಹಯ್ಯ
3. ಮಕ್ಕಳಿಗೆ ವೈಚಾರಿಕತೆಯ ಅಗತ್ಯ : ಕುವೆಂಪು
4. ಅವತಾರಗಳು (ಆಯ್ದ ಭಾಗ) : ಸಿದ್ಧಲಿಂಗಯ್ಯ

Teaching Pedagogy :

ಮಾತು ಮತ್ತು ಬರವಣಿಗೆ (Chalk and talk) ನಿಯೋಜಿತ ಕಾರ್ಯ

Blue print :

ಘಟಕ	ಘಟಕದ ಹೆಸರು	ಬೋಧನಾ ಅವಧಿ	ಅಂಕಗಳು (ಪ್ರತಿ ಘಟಕಕ್ಕೆ)	2 ಅಂಕಗಳು	5 ಅಂಕಗಳು	8 ಅಂಕಗಳು	ಒಟ್ಟು ಅಂಕಗಳು
1	ಕನ್ನಡ ನಾಡು ನುಡಿ ಚಿಂತನೆ	14	40	3	2	3	40
2	ವಿಜ್ಞಾನ ಮತ್ತು ಸಾಹಿತ್ಯ	14	40	3	2	3	40
3	ವೈಜ್ಞಾನಿಕ ಮನೋಧರ್ಮ	14	40	2	4	2	40
4	**ಒಟ್ಟು**	**42**	**120**	**8**	**8**	**8**	**120**

Reference Book :

ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ : ಎಚ್. ತಿಪ್ಪೇರುದ್ರ ಸ್ವಾಮಿ
ಮಲ್ಲಿಗೆ ದಂಡೆ : ಕಾಪಸೆ ರೇವಪ್ಪ
ಗರತಿಯ ಹಾಡು : ಹಲಸಂಗಿ ಚನ್ನಮಲ್ಲಪ್ಪ, ಲಿಂಗಪ್ಪ, ರೇವಪ್ಪ
ಶಿಶುನಾಳ ಶರೀಫರ ನೂರಾರು ತತ್ವಪದಗಳು : ಅ.ರಾ.ಸೇ. (ಸಂಪಾದನೆ)
ಪರಿಮಳ (ವೈಚಾರಿಕ ಲೇಖನಗಳ ಸಂಕಲನ) : ಬಿ.ಪಿ. ಶಿವಾನಂದ ರಾವ್.

Semester-II NEP

Course Title	L1-1-ಕನ್ನಡ ಭಾಷಾ ಪಠ್ಯ–ವರದಾ	CIA Marks	40
Course Code	111AECC1	CIA Marks	40
Scheme (L:T:P)	4:0:0	Credits	3
Teaching Hours	48	Examination Hours	3

Course objectives: This course (111AECC1) will enable the students to

- ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ನಾಡು– ನುಡಿಯ ಸೇವೆಯು ಬದುಕಿನ ಅವಿಭಾಜ್ಯ ಅಂಗ ಎಂಬುದನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಾಹಿತ್ಯದ ಮೂಲಕ ಸದೃಢವಾದ ಬೌದ್ಧಿಕ ವ್ಯಕ್ತಿತ್ವವನ್ನು ಮೈಗೂಡಿಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಭಾಷಾ ಕೌಶಲ್ಯಗಳಲ್ಲಿ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೊಂದುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಮಕಾಲಿನ ವಿದ್ಯಮಾನಗಳ ಅರಿವನ್ನು ಮೂಡಿಸಿಕೊಳ್ಳುವರು.

Course Outcome: After successfully completion of the course, student are able to;

- 111AECC1.1 ಕನ್ನಡ ನಾಡು–ನುಡಿ ಸಂಸ್ಕೃತಿ ಕುರಿತು ತಿಳುವಳಿಕೆಯನ್ನು ವಿಸ್ತರಿಸುವುದು
- 111AECC1.2 ವೈಚಾರಿಕ ಸಂಶೋಧನಾತ್ಮಕ ವಿಮರ್ಶಾತ್ಮಕ ದೃಷ್ಟಿಕೋನವನ್ನು ಬೆಳೆಸುವುದು
- 111AECC1.3 ಸೃಜನಶೀಲತೆ ಅಭಿವ್ಯಕ್ತಿ ಸಾಮರ್ಥ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು
- 111AECC1.4 ಕನ್ನಡದಲ್ಲಿ ತಾಂತ್ರಿಕ ಕೌಶಲ್ಯ ಹಾಗೂ ಉದ್ಯಮಶೀಲತೆಗಳ ತರಬೇತಿ

Mapping of CO with PO

CO	PO									
	1	2	3	4	5	6	7	8	9	10
111AECC1.1						3				
111AECC1.2						3				
111AECC1.3						3				
111AECC1.4						3				

Course Content :

Syllabus- AECC 2 : Title – ಕನ್ನಡ ಭಾಷಾ ಪಠ್ಯ–ವರದಾ–2 **ಒಟ್ಟು ಗಂಟೆಗಳು**

ಘಟಕ 1 : ಜೀವನ ಕಲೆ **14 ಗಂಟೆಗಳು**

1. ಯೋಗ್ಯಾಗೆಲ್ಲಾ ಐತೆ (ಆಯ್ದ ಭಾಗ) : ಬೆಳೆಗೆರೆ ಕೃಷ್ಣಶಾಸ್ತ್ರಿ
2. ಒಡಲಾಳ (ಪುಟ್ಟಗೌರಿಯ ನವಲು) : ದೇವನೂರು ಮಹಾದೇವ
3. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ (ಆಯ್ದ ಭಾಗ) : ಡಿ.ವಿ.ಜಿ.
4. ನಾಳಿನ ಚಿಂತ್ಯಾಕ (ಆತ್ಮಕಥೆ ಆಯ್ದ ಭಾಗ) : ಶಾಂತಾ ಹುಬಳಿಕರ

ಘಟಕ 2 : ಕನಸು **14 ಗಂಟೆಗಳು**

1. ಅಕ್ಕನ ವಚನಗಳು : ಆಯ್ದಭಾಗ
2. ತಿರುಕನ ಕನಸು : ಮುಪ್ಪಿನ ಷಡಕ್ಷರಿ (ತತ್ತ್ವಪದ)
3. ಹಗಲುಗನಸುಗಳು : ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್ (ಪ್ರಬಂಧ)
4. ಸಾಸಿವೆ ತಂದವಳು(ಆಯ್ದ ಭಾಗ) : ಅನು: ಪಿ. ಭಾರತೀದೇವಿ

ಘಟಕ –3 ಮಳೆ ಮತ್ತು ಸಂಕೀರ್ಣ **14 ಗಂಟೆಗಳು**

1. ಧಾರವಾಡದಲ್ಲಿ ಮಳೆಗಾಲ : ಚೆನ್ನವೀರ ಕಣವಿ
2. ಸಾಮಾಜಿಕ ಜಾಲತಾಣಗಳೆಂಬ ಕಲ್ಪಿತಲೋಕಗಳ ಪಯಂ :ಅರುಣ ಜೋಳದ ಕೂಡ್ಲಿಗಿ

3 ಬರ ಅಂದ್ರೆ ಎಲ್ಲರಿಗೂ ಇಷ್ಟ (ಆಯ್ದ ಭಾಗ) : ಪಿ. ಸಾಯಿನಾಥ
4. ಮತ್ತೆ ಮತ್ತೆ ಹುಯ್ಯುತಿದೆ : ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ
5. ಕಾಲುಹಾದಿಯ ಕೋಲ್ಮಿಂಚುಗಳು : ನೇಮಿಚಂದ್ರ

Teaching Pedagogy :

ಮಾತು ಮತ್ತು ಬರವಣಿಗೆ (Chalk and talk,) ನಿಯೋಜಿತ ಕಾರ್ಯ,

Blue print :

ಘಟಕ	ಘಟಕದ ಹೆಸರು	ಬೋಧನಾ ಅವಧಿ	ಅಂಕಗಳು (ಪ್ರತಿ ಘಟಕಕ್ಕೆ)	2 ಅಂಕಗಳು	5 ಅಂಕಗಳು	8 ಅಂಕಗಳು	ಒಟ್ಟು ಅಂಕಗಳು
1	ಜೀವನ ಕಲೆ	14	40	3	2	3	40
2	ಕನಸು	14	40	3	2	3	40
3	ಮಳೆ ಮತ್ತು ಸಂಕೀರ್ಣ	14	40	2	4	2	40
4	**ಒಟ್ಟು**	**42**	**120**	**8**	**8**	**8**	**120**

Reference Book :

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1. ಕರ್ನಾಟಕ ಜಲಜೀವನ : ಬೆಟಗೇರಿ ಕೃಷ್ಣಶರ್ಮ
2. ಚಿತ್ರಗಳು ಪತ್ರಗಳು : ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್
3. ಬಸವಯುಗದ ವಚನಕಾರರು : ಬಸವಕೇಂದ್ರ, ಬೆಂಗಳೂರು
4. ಬರ ಅಂದ್ರೆ ಎಲ್ಲರಿಗೂ ಇಷ್ಟ : ಪಿ. ಸಾಯಿನಾಥ
5. ಯುಗಧರ್ಮ ಮತ್ತು ಸಾಹಿತ್ಯ ದರ್ಶನ : ಕೀರ್ತಿನಾಥ ಕುರ್ತಕೋಟಿ

DEPARTMENT OF ENGLISH

SYLLABUS

(Ist and II NEP, III and IV CBCS)

Semester-I (NEP)

Course Title	Glorious English-1	CIA Marks	40
Course Code	113AECC1	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	3
Teaching Hours	52	Examination Hours	2.30

Course objectives : This course will enable the students to:

- ❖ Enable the students to comprehend and appreciate the poetry.
- ❖ Understand the passage and grasp its meaning.
- ❖ Develop the power of imagination, explanation, critical thinking and moral values through learning of prose.
- ❖ Improve students' communication skills.
- ❖ Use strategies to listen and speak actively and creatively
- ❖ Understand and use functional grammar

Course Outcome : After successful completion of the course, students are able to:

113AECC1.1 Name and relate the literary genres and learn to appreciate prose and poetry.
113AECC1.2 Infer and illustrate the basics of English grammar
113AECC1.3 Identify differences between listening and hearing.
113AECC1.4 Develop the technique of introduction and speech.
113AECC1.5 Utilize the critical thinking skills, analytical skills, presentation skills.

Mapping of CO with PO

CO	PO									
	1	2	3	4	5	6	7	8	9	10
113AECC1.1						2		1		
113AECC1.2						2				
113AECC1.3						2				
113AECC1.4						2				
113AECC1.5						2				

Text Book: Timeless Wisdom, Board of Editors, Orient Blackswan, Hyderabad.

Unit-I Prose **14 Hours**

1. Playing the English Gentleman - Mahatma Gandhi
2. Let's Go Home - Kewlin Sio
3. Marriage is a Private Affair - Chinua Achebe

Unit-II Poetry **14 Hours**

1. River - A. K. Ramanujan
2. The Road not Taken - Robert Frost
3. If - Rudyard Kipling

Unit-III Language skills and Communicative English **16 Hours**

1. Listening skill: what is listening? Listening and hearing, Barriers of listening, Active listening and Passive listening

2. Speaking skill: Self introduction, Introduction of others, welcome speech, vote of thanks, art of anchoring

Unit-IV Language Use - Grammar and Composition **08 Hours**

1. Parts of Speech and their uses
2. Tenses in Use
3. Active Voice and Passive Voice in use

Suggested Reading:

1. R. P. Singh's Functional Skills in Language and Literature, OUP
2. Raymond Murphy's Essential Grammar in Use, CUP
3. P Kiramani dutta, Geetanjal Verma and CLN Prakash, A Course in Communication Skills, CUP
4. Jayashri Mohanraj(ed) Speak Well, Hyderabad: Orient Longman

Teaching Pedagogy :

Lecture method, Group Discussion method, Presentation method, Activity oriented method, Audio and Videos method etc.

B.Sc/ BCA I Semester Scheme / Blueprint for Paper setting (Theory)

Time: 21/2 Hrs **Max Marks: 60**

Unit	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	8 marks	Total marks
I.	Prose	14	16[32]	-	-	2[4]	16[32]
II.	Poetry	14	16[32]	-	-	2[4]	16[32]
III.	Language skills and Communicative English	16	20[40]	-	4[8]	-	20[40]
IV.	Unit – IV Language Use - Grammar and Composition	08	08[16]	4[8]	-	-	8[16]
	Total	**52**	**60[120]**	**08[16]**	**20[40]**	**32[64]**	**60[120]**

Questions Pattern

2 Marks Questions	2 X 4 = 08
5 Marks Questions	5 X 4 = 20
8 Marks Questions	8 X 4 = 32

Semester-II (NEP)

Course Title	Glorious English-2	CIA Marks	40
Course Code	113AECC2	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	03
Teaching Hours	52	Examination Hours	2.30

Course objectives : This course will enable the students to:

1. Appreciate the rhythm, theme, structure and style of the poem.
2. Learn to use strategies of reading and writing.
3. Improve students' communication skills and help them to express well.
4. Develop the presentation skill to use English language without any problem.
5. Encourage the students to take interest to enjoy reading prose.
6. Develop the power of imagination, explanation, critical thinking and moral values through prose.
7. Apply grammatical knowledge to mould their career.

Course Outcome : After successful completion of the course, students are able to :

113AECC2.1 Recall and compare the literary genres and learn to appreciate literary texts.
113AECC2.2 Infer and illustrate the basics of English grammar.
113AECC2.3 Apply reading comprehension techniques.
113AECC2.4 Select appropriate writing style and technique.
113AECC2.5 Utilize the values of social responsibilities, employability with professional skills.

Mapping of CO with PO

CO	PO									
	1	2	3	4	5	6	7	8	9	10
113AECC2.1						2				
113AECC2.2						2				
113AECC2.3						2				
113AECC2.4						2				
113AECC2.5						1		2		

Text Book: Timeless Wisdom, Board of Editors, Orient Blackswan, Hyderabad

I. Prose **14 Hours**

1. Sparrows - K. A. Abbas
2. An Astrologer's Day - R. K. Narayan
3. The Function of Education - J. Krishnamurti

II. Poetry 14 Hours

1. The World is Too Much With Us - William Wordsworth
2. Prayer Before God - Louis MacNeice
3. Gandhi - Niranjan Mohanty

Unit-III Language skills and Communicative English **16 Hours**

1. Reading Skill: Nature and significance of reading, Types, of reading and reading comprehension technique.

2. Writing Skill: Essay writing, paragraph writing, resume and letter writing

Unit – IV Language Use - Grammar and Composition **08 Hours**

1. Sentences- Transformation of Sentences
2. Framing Questions – Wh Questions, Yes/No Questions, Question Tags
3. Error Corrections - Common mistakes, Lexical errors

Suggested Reading :

- R. P. Singh's Functional Skills in Language and Literature, OUP
- Raymond Murphy's Essential Grammar in Use, CUP
- P Kiramani Dutta, Geetanjal Verma and CLN Prakash, A Course in Communication Skills, CUP
- Jayashri Mohanraj(ed) Speak Well, Hyderabad: Orient Longman

Teaching Pedagogy :

Lecture method, Group Discussion method, Presentation method, Activity oriented method, Audio and Videos method etc.

B. Sc. /BCA-II, Semester Scheme / Blueprint for Paper setting (Theory)

Time: 21/2 Hrs **Max Marks: 60**

Unit	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	8 marks	Total marks
I.	Prose	14	16[32]	-	-	2[4]	16[32]
II.	Poetry	14	16[32]	-	-	2[4]	16[32]
III.	Language skills and Communicative English	16	20[40]	-	4[8]	-	20[40]
IV.	Language Use - Grammar and Composition	08	08[16]	4[8]	-	-	8[16]
	Total	**52**	**60**	**08[16]**	**20[40]**	**32[64]**	**60[120]**

Questions Pattern

a. 2 Marks Questions 2 X 4 = 08
b. 5 Marks Questions 5 X 4 = 20
c. 8 Marks Questions 8 X 4 = 32

DEPARTMENT OF HINDI

B.Sc. I Semester - HINDI Syllabus NEP – 2021

Semester-I (NEP)

Course Title	Kahani Sahitya aur Vyakaran (Lockdown & Anuvad)	CIA Marks	40
Course Code	114HIN01T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credit	3
Teaching Hours	52	Examination Hours	2 Hr 30 min.

Course objectives : This course will enable the students:

1. To understand and appreciate the different types of stories.
2. To comprehend the passage and grasp its meaning.
3. To develop the power of imagination explanation, critical thinking and moral values through teaching of prose
4. To Improving students' communicative skills.
5. To understand and to describe the meaning and idea given in the particular text.
6. To enhance comprehension of texts containing those vocabulary.

Course Outcome: After successfully completion of the course, students are able to:

114HIN01T-1: Gadyaon ke tatva ke aadhar par nibandh rachane ki kshamata praapta karne ke prayas hota hai
114HIN01T-2: Chaatro me padane ki adat ka vikas hota hai.
114HIN01T-3: Anuvad ki saiddantik samaj vikasit hogi.
114HIN01T-4: Anuvad ke kshetron ki samaj vikasit hogi.
114HIN01T-5: Anuvad jagat ke vishleshan ki kshamata nirman hogi.
114HIN01T-6: Anuvad ke vyavaharika gnana me vruddi hogi.
114HIN01T-7: Anuvad ki upayogita ko samaj paayenge.
114HIN01T-8: Gnyana ke vibinna kshetron me anuvad karne kushal honge.

Mapping of CO with PO

CO	PO									
	1	2	3	4	5	6	7	8	9	10
114HIN01T-1						2			1	
114HIN01T-2						2			2	
114HIN01T-3						2			2	
114HIN01T-4						2			2	
114HIN01T-5						2			1	
114HIN01T-6						2			1	
114HIN01T-7						2			2	
114HIN01T-8						2			1	

Unit	Content	Hours
1	a) Lockdown b) Karona Saptapadi c) Ghar bechana hai d) Pavitra karya e) Karona mahima	13
2	a) Mata vimata b) Mukti c) Kanhaiya d) Mask e) Vasiyat naama	13
3	Anuvad-Arth paribhasha aur prakar	13
4	Kannada ya Angreji se Hindi me anuvad	13

Textbook : Lockdown – Dhanyakumar Birajdar

Bharatiya Gnanapeeth Prakashan, New Delhi.

Model questions :

Sl.No.	Question	Marks	CO	BTL
1	Lockdown kahani ke vibinna patraon ka naam likiye	2	3	3
2	Anuvad ka paribhasha likiye	2	3	3
3	Dr. Komal ka charitra chitran likiye	5	3	3
4	Anuvad ka mahatva likiye	5	3	3
5	Mata vimata kahani tyaga ka varnan kis prakar kiya gaya hai?	8	3	3
6	Anuvad ke prakaraon ka vivaran kijiye	8	3	3

Note : For NEP: 2, 5 and 8 marks questions

Teaching Pedagogy :

Lecture method, Group Discussion, Presentation, Videos and Activity based etc.

Blue Print : B.Sc. I Semester (Max. Marks. 60)

Unit	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	8 marks	Total marks
1	a) Lockdown b) Karona Saptapadi c) Ghar bechana hai d) Pavitra karya e) Karona mahima	13	30	2	2	2	30
2	a) Mata vimata b) Mukti c) Kanhaiya d) Mask e) Vasiyat naama	13	30	2	2	2	30
3	Anuvad-Arth, paribhasha aur prakar	13	30	2	2	2	30
4	Kannada ya Angreji se Hindi me anuvad	13	30	2	2	2	30
	Total	**52**	**120**	**8**	**8**	**8**	**120**

Model Question Paper

Kahani Sahitya aur Vyakaran (Lockdown & Anuvad)

Time: 2 Hr 30 Min. **Max. Marks. 60**

Instructions :

Answer any four full questions

Q.No.	Unit-1	Marks
1	a)	2
	b)	5
	c)	8
	OR	
2	a)	2
	b)	5
	c)	8
	Unit-2	
3	a)	2
	b)	5
	c)	8
	OR	
4	a)	2
	b)	5
	c)	8
	Unit-3	
5	a)	2
	b)	5
	c)	8
	OR	
6	a)	2
	b)	5
	c)	8
	Unit-4	
7	a)	2
	b)	5
	c)	8
	OR	
8	a)	2
	b)	5
	c)	8

* * * * *

DEPARTMENT OF HINDI

B.Sc. II Semester - HINDI Syllabus NEP

Semester-II (NEP)

Course Title	Adhunik Kavya aur Nibandh (Adhunik Kavya Kaumudi & Nibandh)	CIA Marks	40
Course Code	114HIN02T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credit	3
Teaching Hours	52	Examination Hours	2 Hr 30 min.

Course objectives : This course will enable the students:

1. To appreciate the poem.
2. To understand the thought and imagination contained in the poem.
3. To appreciate the rhyme & rhythm and style of the poem.
4. To train the emotions, feelings and imagination.
5. To develop their aesthetic sense.
6. To create love for Hindi poetry.

Course Outcome : After successfully completion of the course, students are able to:

114HIN02T-1: Kavita ke maadyam se bhavanon ka vikasit hogi.
114HIN02T-2: Sahitya kshetra me abhiruchi praapta hogi
114HIN02T-3: Nibandh se sambadit koushal praapta hogi
114HIN02T-4: Nibandh ke vivida ayamaon ka gnyan praapta hoga.
114HIN02T-5: Lekhan koushal evam vaktavya koushal praapta kar sakata hai.
114HIN02T-6: Vyakaran se sambandit sahi jaanakari praapta kar sakate hai.

Mapping of CO with PO

CO	PO									
	1	2	3	4	5	6	7	8	9	10
114HIN02T-1:						2			1	
114HIN02T-2:						2			2	
114HIN02T-3:						2			2	
114HIN02T-4:						2			2	
114HIN02T-5:						2			1	
114HIN02T-6:						2			1	

Unit	Content	Hours
1	a) Kaikai ka anutaap – Maitali Sharangupta b) Hamara pyara Bharat Varsha- Jayashankar Prasad c) Mai nahi chahata chirsukh-Sumitranandan Pant d) Jeevan Sandesh- RamnareshTripati e) Mera naya bachapan-Subhadrakumari Chavan	13
2	a) Janatantra ka janam-Ramadhari Singh Dinakar b) Varadhan mangunga nahi-Shivamagal Suman c) Preta ka bayana - Nagarjuna d) Dhanaon ke geet- Kedarnath Singh	13
3	Nibandh-Arth, paribhasha, prakar	13
4	a) Vignan se sambandit nibandh b) Samanya nibandh	13

Textbook : Adhunik Kavya Kaumudi.

Editor : Dr. BalachandraTondihal Bhaskar Prakashan, Hubli.

Model questions:

Sl.No.	Question	Marks	CO	BTL
1	Kavi Jayashankar Prasad ka jeevan parichaya likiye	2	3	
2	Nibandh ke arth likiye	2	3	
3	Dinakar ji ne janatantra ka vishleshan kis tarah kiya hai?	5	3	
4	Tripati ji ne jeevan ke baare me kya sandesh diya hai?	5	3	
5	Mera naya bachapan kavita ka saransha likiye	8	3	
6	Pradhushan par nibandh likiye	8	3	

Note: For NEP : 2, 5 and 8 marks questions

Teaching Pedagogy :

Lecture method, Group Discussion, Presentation, Videos and Activity based etc.

Blue Print: B.Sc. II Semester (Max. Marks. 60)

Unit	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	8 marks	Total marks
1	a) Kaikai ka anutaap – Maitali Sharangupta b) Hamara pyara Bharat Varsha- Jayashankar Prasad c) Mai nahi chahata chirsukh- Sumitranandan Pant d) Jeevan sandesh- Ramnaresh Tripati e) Mera naya bachapan- Subhadrakumari Chavan	13	30	2	2	2	30
2	a) Janatantra ka janam-Ramadhari Singh Dinakar b) Varadhan mangunga nahi- Shivamagal Suman c) Preta ka bayana - Nagarjuna d) Dhanaon ke geet- Kedarnath Singh 13	30	2	2	2	30	
3	Nibandh-Arth, paribhasha, Prakar	13	30	2	2	2	30
4	a) Vignan se sambandit nibandh b) Samanya nibandh 13	30	2	2	2	30	
	Total 52	**120**	**8**	**8**	**8**	**120**	

Model Question Paper

Adhunik Kavya aur Nibandh (Adhunik Kavya Kaumudi & Nibandh)

Time: 2 Hr 30 Min. **Max. Marks. 60**

Instructions :

Answer any four full questions

Q.No.	Unit-1	Marks
1	a)	2
	b)	5
	c)	8
	OR	
2	a)	2
	b)	5
	c)	8
	Unit-2	
3	a)	2
	b)	5
	c)	8
	OR	
4	a)	2
	b)	5
	c)	8
	Unit-3	
5	a)	2
	b)	5
	c)	8
	OR	
6	a)	2
	b)	5
	c)	8
	Unit-4	
7	a)	2
	b)	5
	c)	8
	OR	
8	a)	2
	b)	5
	c)	8

* * * * *

DEPARTMENT OF PHYSICS
NEP Mode
Semester-I

Course Title	Mechanics and properties of matter	CIA Marks	40
Course Code	115DSC01T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	2.5

Course objectives : This course (115DSC01T) will enable the students to

- Understand motion of particles.
- Understand the concept of moment of inertia for different rigid bodies.
- Understand viscous property and surface tension of a liquid.

Course Outcome : After successful completion of the course, students are able to;

115DSC01T.1 - Apply basic concepts of units and dimension to study motion of particles.
115DSC01T.2 – Describe the rotation of rigid bodies and Kepler's laws of Planetary motion
115DSC01T.3 – Employ the concepts of elasticity to study the bending of beams.
115DSC01T.4 – Explain the viscous and surface properties of liquid.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115DSC01T.1	3	3				1					3	3	3	3
115DSC01T.2	3	3	2			1	2	3		1	3	3	3	3
115DSC01T.3	3	3		2		3					3	3	3	3
115DSC01T.4	3	3	2	3		1	1			1	3	3	3	3

Course Content

Unit 1

Chapter 1 : Units and measurements: System of units (CGS and SI), measurement of length, mass and time, dimensions of physical quantities, dimensional formulae. Accuracy, Precision and significant figures. Errors, Measurements of errors, types of errors, propagation of errors, definition of graph, Types of graphs. **4 hours**

Chapter 2 : Momentum and Energy: Work and energy, Work-Energy theorem, Conservation of energy with examples. Conservation of linear momentum with examples. Motion of rockets. Problems **4 hours**

Chapter 3 : Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities. Problems **5 hours**

Topics for self-study : Methods to minimize deviation, Conservation of angular momentum with examples, mass-energy equivalence (derivation).

Suggested Activities **2 hours**

Activity No 1

1. i). Students can measure diameters of small balls of different size and estimate their volumes.

ii). Students can measure lengths of nails of different size.

iii). Students can measure volume of a liquid

iv). Students can measure distances and put the result both in CGS and SI units in 2, 3 and 4 significant figures. Ask them to mention the precession of the measurement.

v). students can estimate standard deviations wherever possible.

Activity No 2

Students can try and understand conservation of energy in every day examples. For example:

i) What happens in solar conservation panels.

ii) Pushing an object on the table it moves.

iii) Moving car hits a parked car causes parked car to move.

In these cases, energy is conserved. How? Understand and verify if Possible.

Unit 2

Chapter 4 : Laws of Motion: Newton's Laws of motion. Dynamics of single and a system of particles. Centre of mass. 2 hours

Chapter 5 : Dynamics of Rigid bodies: Rotational motion about an axis, Relation between torque and angular momentum, Rotational energy. Moment of inertia: Parallel and perpendicular axis theorem, M I of a rectangular Lamina and solid cylinder (Derivation). Theory of compound pendulum. Problems **6 hours**

Chapter 6 : Gravitation: Law of Gravitation. Kepler's laws (statements), Motion of a particle in a central force field (motion in a plane, angular momentum is conserved, areal velocity is constant). Satellite in a circular orbit, Problems **5 hours**

Topics for self-study : Theory of Flywheel, Geosynchronous orbits. Basic idea of global positioning system (GPS)

Suggested Activities- 2 hours

Activity no 3 :

Moment of inertia is an abstract concept. It simply gives a measure of rotational inertia of a rigid body and it is proportional to the product of the square of radius, r of the body and its mass, m. Students by referring to websites, can construct and perform simple experiments to verify that MI a mr2., Reference : www.khanacademy.org , www.pinterest.com, www.serc.cerleton.edn

Activity no 4:

Prepare suitable charts and give seminar talks in the class.

Unit 3

Chapter 7 : Elasticity: Hooke's law - Stress-strain diagram, elastic moduli-relation between elastic constants, Poisson's Ratio-expression for Poisson's ratio in terms of elastic constants. Work done in stretching and in twisting a wire-Twisting couple on a cylinder. Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, ? and s by Searle's method, Problems **9 hours**

Chapter 8 : Bending of beams: Neutral surface, neutral axis, plane of bending, bending moment. Expression for bending moment (derivation), uniform bending (derivation). Theory of light cantilever (derivation) Problems. **4 hours**

Topics for self-study : Depression of beam under its own weight, I - section girders, Suggested Activities- **2 hours**

Activity no 5:

Arrange a steel spring with its top fixed with a rigid support on a wall and a meter scale alongside. Add 100 g load at a time on the bottom of the hanger in steps. This means that while putting each 100g load, we are increasing the stretching force by 1N. Measure the extension for loads up to 500g. Plot a graph of extension versus load. Shape of the graph should be a straight line indicating that the ratio of load to extension is constant. Go for higher loads and find out elastic limit of the material.

Activity no 6

Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret.

Unit – 4

Chapter 9 : Surface tension: Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface example, excess pressure inside spherical liquid drop, angle of contact. S.T by Jeager's method, Problems 8 hours

Chapter 10 : Viscosity: Streamline flow, turbulent flow, equation of continuity, determination of coefficient of viscosity by Poisulle's method, Stoke's method. Problems 5 hours

Topics for self-study: Capillarity method, drop weight method of determination of surface tension. Applications of surface tension. Effect of temperature on viscosity.

Suggested Activities-2 hours

Activity no 7

1. Measure surface tension of water and other common liquids and compare and learn

i) Why water has high S.T? think of reasons.

ii) Check whether S.T is a function of temperature? You can do it by heating the water to different temperatures and measure S.T.

iii) Plot S.T versus T and learn how it behaves. Mix some quantity of kerosene or any oil to water and measure ST. Check whether S.T for the mixture is more or less than pure water. List the reasons

Activity no 8 :

2. Collect a set of different liquids and measure their viscosity.

i) Find out whether sticky or non-sticky liquids are most viscous. List the reasons.

ii) Mix non-sticky liquid to the sticky liquid in defined quantities and measure viscosity. Find out viscosity is increasing or decreasing with increase of non-sticky liquid concentration.

iii) Do the above experiment by mixing sticky liquid to the non-sticky liquid. Find out change in viscosity with increase of concentration of sticky liquid. List the applications where concept of Viscosity plays a dominant role

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	8 marks	Total marks
I	1. Units and measurements 2. Momentum and Energy 3. Special Theory of Relativity & self-study	15	30	2T/2P	2T/2P	2T	30
II	4. Laws of Motion 5. Dynamics of Rigid bodies 6. Gravitation & self-study	15	30	2T/2P	2T/2P	2T	30
III	7. Elasticity 8. Bending of beams & self-study	15	30	2T/2P	2T/2P	2T	30
IV	9. Surface tension 10. Viscosity & self-study	15	30	2T/2P	2T/2P	2T	30
	TOTAL	**60**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions : Answer any four questions.

Q.No.		Unit-1	Marks
1.	a)		2 marks
	b)		5 marks
	c)		8 marks
		or	
2.	a)		2 marks
	b)		5 marks
	c)		8 marks
		UNIT 2	
3.	a)		2 marks
	b)		5 marks
	c)		8 marks
		or	
4.	a)		2 marks
	b)		5 marks
	c)		8 marks
		UNIT 3	
5.	a)		2 marks
	b)		5 marks
	c)		8 marks
		or	
6.	a)		2 marks
	b)		5 marks
	c)		8 marks
		UNIT 4	
7.	a)		2 marks
	b)		5 marks
	c)		8 marks
		or	
8.	a)		2 marks
	b)		5 marks
	c)		8 marks

Reference Books :

1. Mechanics (VI-Edition) - J. C. Upadhyay –Ramprasad & Sons, Agra, 2005.
2. Mechanics (XX-Edition) – D. S. Mathur- S. Chand & Company Ltd., New-Delhi, 2007.
3. Mechanics & Electrodynamics (XVII-Edition, Course- 1 & 2) – Brijlal, Subramanyam & Jivan Seshan, S. Chand & Company Ltd., New-Delhi, 2008.
4. Properties of Matter (XIII-Edition) – Brijlal & Subramanyam, Eurasia Publishing House Pvt. Ltd., New-Delhi, 2001.
5. Elements of Properties of Matter (XXVIII-Edition), D. S. Mathur - S. Chand & Company Ltd., New-Delhi, 2005.
6. Physics, Vol. No. I (V-Edition)– Resnick, Halliday & Krane – John Wiley & Sons Inc., New-York, Singapore, 2005.
7. Berkeley Physics, Vol. No. I – ABC Publications, Bangalore & New-Delhi.
8. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004.
9. Introduction to Relativity- R. Resnik.
10. Relativistic Mechanics- Gupta and Kumar.
11. Physics For Degree Students B. Sc. First Year, S. Chand & Company.
12. Electronics Instrumentation by H. S. Kalasi.
13. B.Sc. practical Physics – C.L. Arora.
14. Advanced practical Physics – Samir Kumar Ghosh.
15. Advanced practical Physics – Worsnop and Flint.

DEPARTMENT OF PHYSICS

Semester-I

Course Title	Mechanics and properties of matter practical	CIA Marks	20
Course Code	115DSC01P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives: This course (115DSC01P) will enable the students to

- ❖ Determine the acceleration due to gravity.
- ❖ Determine different moduli of elasticity.
- ❖ Understand parallel axes and perpendicular axes theorem practically.

Course Outcome: After successful completion of the course, student will develop the skill to

115DSC01P.1 - Calculate the acceleration due to gravity using flat spiral spring and bar pendulum.
115DSC01P.2 - Determine the Young's modulus and rigidity modulus for a given material.
115DSC01P.3 - Illustrate parallel and perpendicular axes theorem.
115DSC01P.4 - Estimate the co-efficient of viscosity and surface tension of liquids.
115DSC01P.5 - Compute the moment of inertia of a flywheel.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115DSC01P.1	1			3		2				2	3	3	3	3
115DSC01P.2	1			3		2				2	3	3	3	3
115DSC01P.3	1			3		2				2	3	3	3	3
115DSC01P.4	1			3		2				2	3	3	3	3
115DSC01P.5	1			3		2				2	3	3	3	3

Course Content

1. Gaussian law of errors.
2. Determination of 'g' using bar pendulum (L versus T and L versus LT2 graphs).
3. Determination of moment of inertia of a Fly Wheel.
4. Determination of rigidity modulus using torsional pendulum.
5. Viscosity by Stoke's method.
6. Verification of Hook's law.
7. Study of motion of a spring and to calculate Spring constant, g and unknown mass.
8. Determination of Young's modulus of a bar by the single cantilever method.
9. Determination of Young's modulus of a bar by uniform bending method.
10. Radius of capillary tube by mercury pellet method.
11. Verification of parallel axis theorems.
12. Verification of perpendicular axis theorems.

Blue Print:

Sl.No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**30**

Reference Books :

1. Mechanics (VI-Edition) - J. C. Upadhyay –Ramprasad & Sons, Agra, 2005.
2. Mechanics (XX-Edition) – D. S. Mathur- S. Chand & Company Ltd., New-Delhi, 2007.
3. Mechanics & Electrodynamics (XVII-Edition, Course- 1 & 2) – Brijlal, Subramanyam & Jivan Seshan, S. Chand & Company Ltd., New-Delhi, 2008.
4. Properties of Matter (XIII-Edition) – Brijlal & Subramanyam, Eurasia Publishing House Pvt. Ltd., New-Delhi, 2001.
5. Elements of Properties of Matter (XXVIII-Edition), D. S. Mathur - S. Chand & Company Ltd., New-Delhi, 2005.
6. Physics, Vol. No. I (V-Edition)– Resnick, Halliday & Krane – John Wiley & Sons Inc., New-York, Singapore, 2005.
7. Berkeley Physics, Vol. No. I – ABC Publications, Bangalore & New-Delhi.
8. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004.
9. Introduction to Relativity- R. Resnik.
10. Relativistic Mechanics- Gupta and Kumar.
11. Physics For Degree Students B. Sc. First Year, S. Chand & Company.
12. Electronics Instrumentation by H. S. Kalasi.
13. B.Sc. practical Physics – C.L. Arora.
14. Advanced practical Physics – Samir Kumar Ghosh.
15. Advanced practical Physics – Worsnop and Flint.

DEPARTMENT OF PHYSICS

Semester-I

Course Title	Basic Instrumentation	CIA Marks	20
Course Code	115SBC01P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives: This course (115SBC01P) will enable the students to

- Understand the usage of various tools
- Understand the usage of multimeters.

Course Outcome: After successful completion of the course, students are able to;

115SBC01P.1 - Explain the usage of various measuring tools.
115SBC01P.2 - Describe various workshop techniques.
115SBC01P.3 - Apply the knowledge of electronic devices, circuits and measuring instruments to implement engineering applications.
115SBC01P.4 - Employ the mechanism of KVL & KCL for practical applications.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115SBC01P.1	3		3	3		3					3	3	3	3
115SBC01P.2	3		3	3		3					3	3	3	3
115SBC01P.3	3	2	3	3							3	3	3	3
115SBC01P.4	3	2	3	3							3	3	3	3

Course Content

Basics of electricity and Electrical Cables

Practice procedure for electrical and personal safety measures, Identify the Live, Neutral and Earth on power Socket, construct a test lamp and use it to mains healthiness, use a Tester to monitor AC power. Measure the voltage between the neutral and ground and rectify earthing, Identify and test different ac mains cables, Skin the electrical wires /cables, Measure the gauge of the wire using SWG, Make the mains cable for termination, Cleaning the switch contacts using switch cleaning solution, Testing the fuse. **03 Hours**

Multi-meter

Identify the primary and secondary cells, Charge and discharge the battery, Use a hydrometer to measure the specific gravity of the secondary battery. Use the analog and digital Multimeter to measure the DC voltage by doing measurement at the test points provided, Use the analog and digital Multi-meter to measure AC voltage measurement by doing measurement at the test points provided, Adjust the zero adjustment screw for proper zero setting with the help of a screw driver before using Multi-meter, Replace the battery in the Multi-meter, Replacing the open Fuse with correct rating. **03 Hours**

Basic Electronics Components

Identify the different types of resistors, Identify the power rating using size, Identify different inductors and measure the values using LCR meter, Identify the different capacitors and measure

capacitance of various capacitors using LCR meter, Dismantle and identify the different parts of a relay, Identify different types of mains transformers and test them, Identify the primary and secondary transformer windings ?Measure the primary and secondary voltage of different transformers. **03 Hours**

Power supply

Testing of active components, Practice soldering and de-soldering techniques, Assemble and test– half wave, full wave & bridge rectifier circuits with and without filter, Identify the different types of fixed positive and negative regulator ICs(78/79 series), Identify the pins, Construct a fixed voltage regulator using 78xx/79xx series ICs, Construct a variable voltage regulator using LM 723. **06 Hours**

SEC Laboratory Skill Experiments

1. To observe the loading effect of i) Analog ii) Digital multimeters while measuring across alow resistance and high resistance and to observe the limitations of a multimeter formeasuring high frequency voltage and currents.
2. Soldering and de-soldering technique (Solder given electronic circuit and check its working).
3. Use of CRO – Measurement of AC voltage and frequency for sine and square waves.
4. Use of CRO – Determination of phase shift using RC network and study of Lissajous figures.
5. Converting the range of a given measuring instrument (voltmeter, ammeter) Basics of transformers. Winding a coil / transformer.
6. Using Resistive network study of star to delta network conversion or vice-versa. Show thatthey are equivalent.
7. Experimental study of KVL and KCL using DC source and resistive network.
8. Calibration of analog voltmeter and ammeter.
9. Conversion of galvanometer to ohm-meter for at least two ranges.

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	30

Reference Books :

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
5. New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]

DEPARTMENT OF PHYSICS

Semester-I

Course Title	Energy sources	CIA Marks	40
Course Code	115OEC01T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	39	Examination Hours	2.5

Course objectives : This course (115OEC01T) will enable the students to

- Understand sources of energy.
- Understand PV systems.
- Understand the methods of harvesting the energy.

Course Outcome : After successful completion of the course, students are able to;

115OEC01T.1 – Explain different types of renewable and non-renewable energy sources.
115OEC01T.2 – Employ the concept of solar energy for different applications.
115OEC01T.3 – Recognize different types of energy harvesting.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115OEC01T.1	3	3		3				3			3	3	3	3
115OEC01T.2	3	3		3				3			3	3	3	3
115OEC01T.3	3	3		3				3			3	3	3	3

Course Content

Unit-I -Non-Renewable energy sources

Chapter-1 : Introduction

Energy concept-sources in general, its significance & necessity. Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy, based on origin-Examples and limitations. Importance of Non-commercial energy resources. 04

Chapter-2 : Conventional energy sources

Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues& challenges. Overview of Indian & world energy scenario with latest statistics- consumption & necessity. Need of eco-friendly& green energy & their related technology. **09**

Total 13 hours

Unit-II -Renewable energy sources

Chapter-1 : Introduction:

Need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy,

Hydroelectricity. **05**

Chapter 2 : Solar energy:

Solar Energy-Key features, its importance, Merits & demerits of solar energy,

Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell -brief discussion of each. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems. **08**

Total 13 hours

Unit-III

Chapter-3 : Wind and Tidal Energy harvesting:

Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy. **08**

Chapter-4 : Geothermal and hydro energy

Geothermal Resources, Geothermal Technologies. **02**

Hydropower resources, hydropower technologies, environmental impact of hydro power sources. **03**

Carbon captured technologies, cell, batteries, power consumption **01**

Total 13 hours

Activity for tutorial classes 01 lectures/week

1. Demonstration of on Solar energy, wind energy, etc, using training modules atLabs.
2. Conversion of vibration to voltage using piezoelectric materials.
3. Conversion of thermal energy into voltage using thermoelectric (usingthermocouples or heat sensors) modules.
4. Project report on Solar energy scenario in India
5. Project report on Hydro energy scenario in India
6. Project report on wind energy scenario in India
7. Field trip to nearby Hydroelectric stations.
8. Field trip to wind energy stations like Chitradurga, Hospet, Gadag, etc.
9. Field trip to solar energy parks like Yeramaras near Raichur.
10. Videos on solar energy, hydro energy and wind energy.

Blue print :

Unit	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	8 marks	Total marks
I	Non-Renewable energy sources	13	32	3T	2T	2T	32
II	Renewable energy sources	13	45	3T	3T	3T	45
III	Wind and Tidal Energy harvesting:						
	Geothermal and hydro energy	13	43	2T	3T	3T	43
	TOTAL	**39**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions: Answer any four questions.

UNIT 1

1.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
2.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 2

3.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
4.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 3

5.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
6.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 4

7.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
8.	a)	2 marks
	b)	5 marks
	c)	8 marks

Note : The questions for unit-4 should be chosen from all the three units.

Reference Books :

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New,Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company,Ltd.
4. Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford niversity Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich,(USA).
7. http://en.wikipedia.org/wiki/Renewable_energy

DEPARTMENT OF PHYSICS

Semester-II

Course Title	Electricity and Magnetism	CIA Marks	40
Course Code	115DSC02T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	3

Course objectives: This course (115DSC02T) will enable the students to

- ❖ Understand Gauss's law for different cases
- ❖ Understand Ampere's circuital law in determining the magnetic fields.
- ❖ Understand thermoelectric laws.
- ❖ Understand different combinations of LCR circuits.

Course Outcome : After successful completion of the course, students are able to;

115DSC02T.1 - Employ Gauss's theorem to find the electric potential for different cases and effect of dielectric on capacitance.
115DSC02T.2 - Illustrate Magnetic and mechanical effect of electric current
115DSC02T.3 – Describe AC through the circuital elements such as resistor, inductor and capacitor.
115DSC02T.4 - Apply electromagnetic vector fields and Maxwell's equations to the solution of electromagnetic waves through vacuum and dielectric medium.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115DSC02T.1	3	3				1					3	3	3	3
115DSC02T.2	3	3	2			1	2	3		1	3	3	3	3
115DSC02T.3	3	3		2		3					3	3	3	3
115DSC02T.4	3	3	2	3		1	1			1	3	3	3	3

Course Content

Unit 1

Topics to be covered/taught/learnt:

Chapter-1

Electrostatics

Electric charge and field, Coulomb's law, electric field strength, electric field lines, point charge in an electric field and electric dipole, work done by a charge (derivation of the expression for potential energy) problems **3 hours**

Chapter -2

Laws of Electrostatics

Gauss's law and its applications, electric fields of a (i) spherical charge distribution, (ii) line charge and (iii) an infinite flat sheet of charge. Problems **3 hours**

Chapter -3

Electric Potential

Electric potential, line integral, gradient of a scalar function, relation between field and potential. Potential due to point charge and distribution of charges (Examples: potential associated with a spherical. charge distribution, infinite line charge distribution, infinite plane sheet of charges). Constant potential surfaces, Potential due to a dipole(derivation) and electric quadrupole(qualitative). Problems 7 hours

Topics for self-study- Constant potential surfaces,Problems.

Suggested Activities

Activities: 1

Static electricity activities, refer to the link_https://www.youtube.com/watch?v=pIMG_R6mKQ0

Unit 2

Chapter 4

Basics of dielectrics

Introduction to dielectric materials. Polar and nonpolar moleculeswith examples. Gauss law in a dielectric medium. Dielectric in an electric field, electricpolarization (P), electric displacement (D), electric susceptibility (?) and atomic polarizability(a), relation between D, E and P5 hours

Chapter 5

Theory of dielectrics

Mechanism of polarization, Dielectric constant and loss, Derivation of Clausius–Mosotti equation and its limitations. Langevin-Debye theory of polarization in polar dielectrics. Determination of dielectric constant for liquids and solids by Hopkinson's method. 8 hours

Topics for self-study-Conductors and insulators, conductors in electric field. Capacitance and capacitors, conduction in metals and semiconductors.

Activity 2

1. Learn about types of resistors and capacitors, their color codes and types of capacitors(electrolytic and non-electrolytic)

Activity 3

1 Study of capacitor composition(class room project)

Unit 3

Chapter 6

Magnetism

Definition of magnetic field, magnetic force and flux,flux density, Biot-Savart law,magnetic field due to linear conductor carrying current, Ampere's law, determination of magnetic field due to solenoid,problems4 hours

Chapter 7

Electrical Instruments, Measurements

Theory of moving coil galvanometer, ballistic& dead beat. Charge and current sensitivity and their relationship, correction for damping.Measurement of capacitance of a capacitor by absolute

method using B.G. Measurement ofhigh resistance by leakage method using B.G.5 hours

Chapter 8

Alternating current circuits:Alternating current, Resonant circuit, LCR series and parallel circuitusing j-operator, admittance and impedance,quality factor, power and energy in AC circuits, problems 4 hours

Topics for self-study : Hall effect and applications.

Activity no 4

1. Learn the difference between DC and AC electricity and their characteristics. Voltage and line frequency standards in different countries.
2. Study on production of electricity as a source of energy: Different methods

Activity no 5

1. Learn to use a multimeter (analog and digital) to measure voltage, current and resistance, Continuity testing of a wire.
2. Learn about household electrical connection terminals: Live, neutral and ground and voltage between the terminals. Role of earthing and safety measures

Unit 4

Chapter 9

Electromagnetic waves : Fields, types of fields, flux and circulation of a vector field, gradient of a scalar field and its significance. Divergence and curl of a vector field and their significance; Gaussdivergence theorem, Stokes theorem and Green's theorem (statements). Continuity equation (proof) and its significance. Inconsistency in Ampere's circuital law and the concept of displacement current. Integral form of Maxwell's equations of electromagnetic theory (mention and explanation,Setting up of the differential form of Maxwell's equations (derivations). Application of Maxwell's equations to dielectric and conducting media; **10 hours**

Chapter 10

Magnetic materials

Types of magnetic materials: Diamagnetic, Paramagnetic and Ferromagnetic Materials. B-H hysteresis curves, Soft and hard magnetic materials.

Topics for self-study : Ferrimagnetic and Antiferromagnetic materials, Applications of magnetic materials.

Activity 6

1. Prepare a small project report on production of magnetic field:Permanent magnets, electromagnets and superconductingmagnets.
2. Learn the principle of working of a Gauss meter to measuremagnetic field

Activity 7

Model the earth's magnetic field with a diagram. Explain the effect of tilt of the earth's axis and reasons for the change in the tilt of the earth's axis over thousands of years

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Chapter	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	8 marks	Total marks
I	1.	Electrostatics	15	30	2T/2P	2T/2P	2T	30
	2.	Laws of Electrostatics						
	3.	Electric Potential & Self studies						
II	4.	Basics of dielectrics	15	30	2T/2P	2T/2P	2T	30
	5.	Theory of dielectrics & Self studies						
III	6.	Magnetism	15	30	2T/2P	2T/2P	2T	30
	7.	Electrical Instruments,						
		Measurements						
	8.	Alternating current circuits & Self studies						
IV	9.	Electromagnetic waves	15	30	2T/2P	2T/2P	2T	30
	10.	Magnetic aterials & Self studies						
		TOTAL	**60**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions : Answer any four questions.

UNIT 1

3. a) 2 marks
   b) 5 marks
   c) 8 marks

1. a) 2 marks
   b) 5 marks
   c) 8 marks

or

2. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 2

3. a) 2 marks
   b) 5 marks
   c) 8 marks

or

4. a) 2 marks
   b) 5 marks

c) 8 marks

UNIT 3

5. a) 2 marks
   b) 5 marks
   c) 8 marks

or

6. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 4

7. a) 2 marks
   b) 5 marks
   c) 8 marks

or

8. a) 2 marks
   b) 5 marks
   c) 8 marks

Reference Books :

1. Electricity and Magnetism: R. Murugeshan
2. Electricity and Magnetism: D.N.Vasudeva
3. Electricity and Magnetism: K.K.Tewari
4. Electromagnetism: B.B Laud
5. Electricity and Magnetism: Khare and Srivatsav
6. Electricity and Magnetism: Brijlal and M Subrahmanyam
7. Electricity and Magnetism: Segal and Chopra
8. Fundamental of magnetism and Electricity: D. N. Vasudev
9. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
10. Electricity and Magnetism, J.H. Fawkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
11. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
    University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
12. Fundamentals of Electricity and Magnetism: B.D. Duggal, C.L. Chhabra
13. Vector analysis: Hague
14. Electromagnetics: Griffith Electrictriciy, magnetism and electromagnetic Theory: S.R. Manohara and Shubha

DEPARTMENT OF PHYSICS

Semester-II

Course Title	Electricity and Magnetism	CIA Marks	20
Course Code	115DSC02P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives : This course (115DSC02P) will enable the students to

- Understand thermoelectric laws.
- Understand different combinations of LCR circuits.

Course Outcome : After successful completion of the course, students are able to;

115DSC02P.1 - Calculate the capacitance by different methods.
115DSC02P.2 - Determine time constants for RC and RL circuits.
115DSC02P.3 - Illustrate series and parallel resonance through LCR circuits.
115DSC02P.4 - Use different types of galvanometers to find different physical quantities.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115DSC02P.1	1			3		2				2	3	3	3	3
115DSC02P.2	1			3		2				2	3	3	3	3
115DSC02P.3	1			3		2				2	3	3	3	3
115DSC02P.4	1			3		2				2	3	3	3	3

Course Content

1. Determination of components of earth's magnetic field using a Stewart and Gee's apparatus.
2. Determination of capacitance of a condenser using B.G.
3. Determination of high resistance by leakage method
4. Determination of figure of merit and volt sensitivity of B.G
5. Charging and discharging of a capacitor(energy dissipated during charging and time constant measurements).
6. Series resonance circuits (LCR circuits).
7. Parallel resonance circuits (LCR circuits).
8. Impedance of series RC circuits- determination of frequency of AC.
9. Study the characteristics of a series RC and RL Circuit.
10. Determination of self-inductance of a coil.
11. Verification of laws of combination of capacitances and determination of unknown capacitance using de –Sauty's bridge.
12. Determination of BH using Helmholtz double coil galvanometer

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**30**

Reference Books :

1. Electricity and Magnetism: R. Murugeshan
2. Electricity and Magnetism: D.N.Vasudeva
3. Electricity and Magnetism: K.K.Tewari
4. Electromagnetism: B.B Laud
5. Electricity and Magnetism: Khare and Srivatsav
6. Electricity and Magnetism: Brijlal and M Subrahmanyam
7. Electricity and Magnetism: Segal and Chopra
8. Fundamental of magnetism and Electricity: D. N. Vasudev
9. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
10. Electricity and Magnetism, J.H. Fawkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
11. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
    University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
12. Fundamentals of Electricity and Magnetism: B.D. Duggal, C.L. Chhabra
13. Vector analysis: Hague
14. Electromagnetics: Griffith
    Electrictriciy, magnetism and electromagnetic Theory: S.R. Manohara and Shubha

DEPARTMENT OF PHYSICS

Semester-II

Course Title	Climate Science	CIA Marks	40
Course Code	115OEC02T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	39	Examination Hours	2.5

Course objectives : This course (115OEC02T) will enable the students to

- Understand different layers of the atmosphere.
- Understand different types of climates.

Course Outcome : After successful completion of the course, students are able to;

115OEC02T.1 – Explain the physical structure and composition of atmosphere.
115OEC02T.2 – Measure different parameters of climate.
115OEC02T.3 – Illustrate classification and causes of climate changes.

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
115OEC02T.1	3	3		3		3		2		3	3	3	3	3
115OEC02T.2	3	3		3		3		2		3	3	3	3	3
115OEC02T.3	3	3		3		3		2		3	3	3	3	3

Course Content

Unit 1 : Atmosphere: Atmospheric Science (Meteorology) as a multidisciplinary science. Physical and dynamic meteorology, some terminology, difference between weather and climate, weather and climate variables, composition of the present atmosphere: fixed and variable gases, volume mixing ratio (VMR), sources and sinks of gases in the atmosphere. Greenhouse gases. Structure(layers) of the atmosphere. Temperature variation in the atmosphere, temperature lapse rate, mass, pressure and density variation in the atmosphere. Distribution of winds. **(13 hours)**

Unit 2 : Climate Science Overview of meteorological observations, measurement of: temperature, humidity, wind speed and direction and pressure. Surface weather stations, upper air observational network, satellite observation. Overview of clouds and precipitation, aerosol size and concentration, nucleation, droplet growth and condensation (qualitative description). Cloud seeding, lightning and discharge. Formation of trade winds, cyclones. Modelling of the atmosphere: General principles, Overview of General Circulation Models (GCM) for weather forecasting and prediction. Limitations of the models. R and D institutions in India and abroad dedicated to climate Science, NARL, IITM, CSIR Centre for Mathematical Modeling and Computer Simulation, and many more **(13 hours)**

Unit 3 : Global Climate Change Green house effect and global warming, Enhancement in concentration ofcarbon dioxide and other green house gases in the atmosphere, Conventional and non-conventional energy sources and their usage. EL Nino/LA NinoSouthern oscillations. Causes for global warming: Deforestation, fossil fuel burning, industrialization. Manifestations of global warming: Sea level rise, melting of glaciers, variation in monsoon patterns, increase in frequency

andintensity of cyclones, hurricanes,tornadoes.Geo-engineering as a tool to mitigate global warming? Schemes of geoengineering. **(13 hours)**

Activities to be carried out on Climate Science:

1. Try to find answer to the following questions:
   (a) Imagine you are going in a aircraft at an altitude greaten than 100 km. The air temperature at that altitude will be greater than 200oC. If you put your hands out of the window of the aircraft, you will not feel hot.
   (b) What would have happened if ozone is not present in the stratosphere.
2. Visit a nearby weather Station and learn about their activities.
3. Design your own rain gauge for rainfall measurement at your place.
4. Learn to determine atmospheric humidity using wet bulb and dry bulb thermometers.
5. Visit the website of Indian Institute of Tropical Meteorology (IITM), and keep track of occurrence and land fall of cyclone prediction.
6. Learn about ozone layer and its depletion and ozone hole.
7. Keep track of melting of glaciers in the Arctic and Atlantic region through data base available over several decades.
8. Watch documentary films on global warming and related issues (produced by amateur film makers and promoted by British Council and BBC).

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Chapter	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	8 marks	Total marks
I		Atmosphere:	13	32	3T	2T	2T	32
II		Climate Science	13	45	3T	3T	3T	45
III		Global Climate Change	13	43	2T	3T	3T	43
		TOTAL	**39**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions : Answer any four questions.

UNIT 1

1.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
2.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 2

3.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
4.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 3

5.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
6.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 4

7.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
8.	a)	2 marks
	b)	5 marks
	c)	8 marks

Reference Books :

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
5. Why the weather, Charls Franklin Brooks, 1924, Chpraman & Hall, London.
6. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

Department of Chemistry (U. G.)

SYLLABUS
Semester- I Theory (CBCS)

Course Title	GENERAL CHEMISTRY-I	CIA Marks	30
Course Code	DSC-CHEM-101	SEE Marks	70
Scheme (L:T:P)	4:0:0	Credit	4
Teaching Hours	60	Examination Hours	3

Course objectives : This course (DSC-CHEM-101) will enable the students to

1. Atomic structure and the periodicity of elements.
2. Principles of Chemical Bonding.
3. Fundamentals of organic chemistry.
4. Properties and Reactions of Aliphatic Hydrocarbons.
5. Stereochemistry of organic compounds.

Course Outcome: After successfully completion of the course, student are able to;

DSC-CHEM-101.1- Discuss the atomic structure, Shapes of different orbitals and electronic configuration of atoms.
DSC-CHEM-101.2- Apply the concepts of ionic and covalent bonding to inorganic molecules.
DSC-CHEM-101.3- Apply molecular orbital theory to explain the properties of diatomic molecule.
DSC-CHEM-101.4- Describe the fundamental concepts of organic chemistry to evaluate the 3D structure and properties of simple organic molecules.
DSC-CHEM-101.5- Describe the methods of preparation, properties and reactions of aliphatic hydrocarbons.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1 PCM	2 CBZ	3 CZBt/ CBBt	4 CZMb/ CBMb
DSC-CHEM-101.1	2	1									1	1	1	1
DSC-CHEM-101.2	1	3									1	1	1	1
DSC-CHEM-101.3	1	2									1	1	1	1
DSC-CHEM-101.4		3									1	1	1	1
DSC-CHEM-101.5		1						1		1	1	1	1	1

UNIT-I: Atomic Structure

Review of Bohr's theory and its limitations, dual behaviour of matterand radiation, de Broglie's relation, Heisenberg's Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

Elements of Quantum chemistry - Schrodinger equation and meaning of various terms in it. Significance of Ψ and Ψ^2.Schrödinger equation for hydrogen atom. Radial and angular parts of hydrogen wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (only graphical representation). Radial and angular nodesand their significance.Radial distribution

functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals.

Quantum Numbers : Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapes of s, p and d-atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spinquantum number (m_s).

Rules for filling up of electrons in various orbitals (Aufbau principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity and n+l rule), Electronic configuration of the elements (up to Z=30) and anomalous electronic configurations. Stability of half-filled and completely filled orbitals-concept of pairing and exchange energy. Relative energies of atomic orbitals. Anomalous electronic configurations.

UNIT-II : Chemical Bonding

Ionic Bonding : Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Lande's equation for calculation of lattice energy. Born-Haber cycle and its applications, polarizing power and polarizability.

Fajan's rules, ionic character in covalent compounds, dipole moment and percentage ionic character.

Covalent bonding : VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR theoryand hybridization with suitable examples of linear, trigonal planar, square planar,tetrahedral, trigonalbipyramidal and octahedral arrangements. **(12 Lectures)**

UNIT-III : Molecular Structure

Concept of resonance and resonating structures in various inorganic and organic compounds. MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s- s, s-p and p-p combinations of atomic orbitals, non-bonding combinationof orbitals, MO treatment of homo-nuclear diatomic molecules (Hydrogen to Oxygen), O_2^- , O_2^{2-} and hetero-nuclear diatomic molecules such as CO, NO andNO^+. Comparison of VB and MO approaches.

(12 Lectures)

UNIT-IV : Fundamentals of Organic Chemistry

Electronic effects : Electronic displacement effects: Inductive Effect, Electromeric Effect, Resonance, Hyperconjugation and their significance.

Cleavage of Bonds : Homolysis and Heterolysis, Nucleophiles and electrophiles.

Reactive Intermediates : Generation, stability and reactions involving carbocations, carbanions and free radicals.

Strength of organic acids and bases : Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

Stereochemistry : Conformations with respect to ethane, butane and cyclohexane. Interconversion of WedgeFormula, Newmann, Sawhorse and Fischer representations.Concept of chirality (uptotwocarbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds. Threo and erythro; D and L;cis–transnomenclature; CIP Rules: R/S (for upto 2 chiral carbon atoms) and E / Znomenclature (for up to two C=C systems). (12 Lectures)

UNIT-V: Aliphatic Hydrocarbons

Alkanes : (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.

Alkenes : (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and

dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff'saddition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.

Alkynes : (Upto 5 Carbons) Preparation: Acetylene from CaC2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alk. KMnO4. **(12 Lectures)**

Blue print of paper setting

Unit	Name of the topics	Teaching hrs	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Atomic Structure and Quantum Numbers	12	21	01	2	1	22
2	Chemical Bonding	12	21	01/02	2	1	19
3	Molecular Structure	12	21	01	1	1	22
4	Fundamentals of Organic Chemistry	12	21	01	2	1	22
5	Aliphatic Hydrocarbons	12	21	01/02	1	1	19
6	**Total**	**60**	**104**	**07**	**08**	**05**	**104**

Question paper pattern :

Time: 3Hrs Max Marks: 70

Instructions :

1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10
II. Derive / Explain/Solve any SIX Out of NINE (3 Problems out of 9) 6 X 5 = 30
III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

References :

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. &Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in InorganicChemistry, John Wiley & Sons.
4. Huheey, J.E., Keiter, E.A., Keiter, R.L. &Medhi, O.K. Inorganic Chemistry:Principles of Structure and Reactivity, Pearson Education India, 2006.
5. Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. Organic Chemistry, JohnWiley& Sons (2014).
6. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning IndiaEdition, 2013.
7. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, NewDelhi (1988).
8. Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education,2000.
9. Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
10. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
11. Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.

Department of Chemistry (U. G.)

SYLLABUS
Semester- I Practical (CBCS)

Course Title	Chemistry Practical	CIA Marks	15
Course Code	DSC-CHEM-101-LAB	SEE Marks	35
Scheme (L:T:P)	0:0:4	Credit	2
Teaching Hours	30	Examination Hours	4

Course objectives : This course (DSC-CHEM-101-LAB) will enable the students to

1. Preparation of standard solution of different concentartions
2. Determination of the amount of substance present in the given solution
3. Identify and separate the components of a given mixture of 2 amino acids using paper chromatography
4. Identify and separate the sugars present in the given mixture by paper chromatography

Course Outcome: After successfully completion of the course, student are able to;

DSC-CHEM-101-LAB.1- Adopt the principles of Volumetric Analysis in the determination of the amount of substance present in the given solution

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
											PCM	CBZ	CZBt/ CBBt	CZMb/ CBMb
DSC-CHEM -101-LAB.1	2	2		3					1	2	2	2	2	2

Volumetric Analysis :

1. Determination of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determinationof oxalic acid by titrating with KMnO4.
3. Determination of Fe(II) ions by titrating with K2Cr2O7 using internal indicator.
4. Determination of Cu(II) ions by iodometrically using Na2S2O3.
5. Determination 0f Zn(II) ions by titrating with EDTA.
6. Determination of total hardness of water by using EDTA.
7. Determination of iodine by titrating with Na2S2O3.
8. Determination of chlorine in bleaching powder.

Organic Chemistry :

Separation of mixtures by Chromatography : Measure the Rf value in each case(combination of two compounds to be given)

A) Identify and separate the components of a given mixture of 2 amino acids (glycine,aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography

B) Identify and separate the sugars present in the given mixture by paper chromatography.

Scheme of evaluation

Distribution of marks			Variation of results	
Accuracy	:	18	+ 0.2 cc	18
Technique and presentation	:	05	+ 0.4 cc	14
Calculation	:	04	+ 0.6 cc	10
Practical record	:	04	+ 0.8 cc	06
Viva	:	04	+ 1.0 cc and above	00
Total	**:**	**35**		

References :

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbookof Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

Department of Chemistry (U. G.)

SYLLABUS

Semester- II Theory (CBCS)

Course Title	General Chemistry-II	CIA Marks	30
Course Code	DSC-CHEM-202	SEE Marks	70
Scheme (L:T:P)	4:0:0	Credit	4
Teaching Hours	60	Examination Hours	3

Course objectives: This course (DSC-CHEM-202) will enable the students to

1. Principles of thermodynamics and thermochemistry
2. Principles of ionic equillibrium
3. Explain the concept of aromaticity in organic compounds
4. Methods of preparation properties and reactions of aromatic and oxygen containing hydrocarbons

Course Outcomes : After successfully completion of the course, student are able to;

DSC-CHEM-202.1- Study enthalpy and entropy based on laws of thermodynamics
DSC-CHEM-202.2- Apply the equilibrium concepts to solids, liquids and gases
DSC-CHEM-202.3- Describe the methods of preparation of simple oxygen and halogen containing aromatic hydrocarbons
DSC-CHEM-202.4- Elucidate the structure and property of organic compounds
DSC-CHEM-202.5- Discuss the reactions of aromatic, orxygen and halogen containing hydrocarbons

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
											PCM	CBZ	CZBt/ CBBt	CZMb/ CBMb
DSC-CHEM-202.1	2	1									1	1	1	1
DSC-CHEM-202.2	2	1									1	1	1	1
DSC-CHEM-202.3		1		1						1	1	1	1	1
DSC-CHEM-202.4	1	1	2	2							1	1	1	1
DSC-CHEM-202.5		3									1	1	1	1

UNIT-I : Chemical Energetics

Review of thermodynamics and the Laws of Thermodynamics.Important principles and definitions of thermochemistry.Concept of standard state andstandard enthalpies of formations, integral and differential enthalpies of solution and dilution.

Calculation of bond energy, bond dissociation energy and resonance energy fromthermochemicaldata.Variation of enthalpy of a reaction with temperature – Kirchhoff'sequation.Statement of Third Law of thermodynamics and calculation of absolute entropies ofsubstances.Numerical problems. **(12 Lectures)**

UNIT-II: Chemical Equilibrium

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium.Distinction between ?G and ?Go, Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases.Numerical problems.

Ionic Equilibria : Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree ofionization, ionization constant and ionic product of water. Ionization of weak acids and bases,pH scale, common ion effect.Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts.Buffer solutions.Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.Debye Huckel theory of strong electrolytes.Numerical problems. **(12 Lectures)**

UNIT-III : Aromatic hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene

Sulphonic acid.Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation andsulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene).Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Polynuclear hydrocarbons – Classification with examples. Isolation of Naphthalene from coal tar. Structural elucidation of naphthalene & synthesis by Haworth's method. **(12 Lectures)**

UNIT-IV: Halogenated organic compounds

Alkyl Halides (Upto 5 Carbons): Preparation: from alkenes and alcohols.Reactions: Types of Nucleophilic Substitution (S_N1 & S_N2) reactions.Hydrolysis, nitrite & nitro formation, nitrile &isonitrileformation.Williamson'sether synthesis.

Aryl Halides : Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer&Gattermannreactions.Reactions (Chlorobenzene): Aromatic nucleophilicsubstitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or $NaNH_2/NH_3$).Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and arylhalides. **(12 Lectures)**

UNIT-V : Oxygen containing organic compounds

Alcohols: Preparation: Preparation of 1^0, 2^0 and 3^0 alcohols: using Grignard reagent, Esterhydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions : With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3).Pinacol-Pinacolone rearrangement.

Phenols : (Phenol case) Preparation : Cumenehydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution : Nitration, halogenation and sulphonation.

Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten –Baumann Reaction.

Epoxides : Synthesis by Darzen's method. Acid and base catalyzed opening of epoxides.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone andbenzaldehyde). Preparation: from acid chlorides and from nitriles.Reactionswith HCN, ROH, $NaHSO_3$, NH_2-G derivatives.Iodoformtest.AldolCondensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation &Clemensenreduction. **(12 Lectures)**

Blue print of paper setting

Unit	Name of the topics	Teaching hrs	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Chemical Energetics	12	21	01/02	2	1	22
2	Chemical Equilibrium	12	21	01	2	1	22
3	Aromatic hydrocarbons	12	21	01	2	1	22
4	Halogenated organic compounds	12	21	01/02	1	1	19
5	Oxygen containing organic compounds	12	20	01/02	**1**	**1**	**19**
6	**Total**	**60**	**104**	**07**	**08**	**05**	**104**

Question paper pattern:

Time: 3Hrs Max Marks: 70

Instructions :

1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10

II. Derive / Explain/Solve any SIX Out of NINE (3 Problems out of 9) 6 X 5 = 30

III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

References :

1. Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. Organic Chemistry, JohnWiley& Sons (2014).
2. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India, Edition, 2013.
3. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, NewDelhi (1988).
4. Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
5. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
6. Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
7. Barrow, G.M. Physical Chemistry Tata McGraw, Hill (2007).
8. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
9. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry CengageLearningIndiaPvt. Ltd., New Delhi (2009).
10. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
11. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York(1985).

Department of Chemistry (U. G.)

SYLLABUS
Semester-II Practical (CBCS)

Course Title	Chemistry Practical	CIA Marks	15
Course Code	DSC-CHEM-202-LAB	SEE Marks	35
Teaching Hours	30	Examination Hours	3

Course objectives: This course (DSC-CHEM-202-LAB) will enable the students to

1. Identification of the nature of solid-solid mixture and Separte it
2. Analyse the separated components
3. Purifcation of separated components and determination of physical constants
4. Preparation of derivatives

Course Outcomes: After successfully completion of the course, student are able to;

DSC-CHEM-202-LAB.1. Expertise to analyse the solid-solid mixtures of organic compounds and preparation of their derivatives

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
DSC-CHEM-202-LAB.1	2	2		3					1	2	2	2	2	2

SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS AND ORGANIC PREPARATIONS

Part 1 : Systematic qualitative organic analysis of the following compounds (Minimum 6 compounds).

1. Acids (Benzoic acid, Salicylic acid, Cinnamic acid)
2. Alcohols (Ethyl alcohol, Benzyl alcohol)
3. Aldehydes (Acetaldehyde, Benzaldehyde)
4. Amides (Acetamide, Benzamide)
5. Amines (Aniline, o- & p-Nitroanilines)
6. Halogenated hydrocarbons (Chlorobenzene)
7. Hydrocarbons (Naphthalene, Anthracene)
8. Ketones (Acetone, Acetophenone)
9. Nitro compounds (Nitrobenzene, m-dinitrobenzene)
10. Phenols (Phenol, 1-Naphthol, 2-Naphthol)

Part 2 : Organic preparations: Recrystallisation and determination of melting point and itsimportance may be mentioned.

1. Acetylation : Preparation of acetanilide from aniline.
2. Oxidation: Preparation of benzoic acid from benzaldehyde.
3. Nitration: Preparation of m-dinitrobenzene from nitrobenzene.
4. Bromination: Preparation of 2,4,6-tribromophenol.
5. Bromination: Preparation of p-bromoaniline.
6. Diazotization: preparation of methyl orange.

Note : Preparation-equation, recrystallisation, theoretical and practical yield.

Scheme of Evaluation

Experiments on Organic spotting of simple Binary mixtures

The candidates should perform 10 experiments.

- o Continuous internal Practicalassessment(5+10) : 15 marks
- o Semester endPracticalexamination : 35marks

Distribution of marks :

1. Separation & Identification of oneOrganiccompound : 20marks
2. PracticalRecord : 05marks
3. Technique&Presentation : 05marks
4. Viva-Voce : 05marks

   Total = 35 marks

Scheme of marking for separation & identification:

Nature & separation of binary mixture	07
Preliminary and solubility test	03
Physical constants	02
Element tests	03
Functional group test	03
Identification & structure of the compound	02

References :

1. Text Book of Practical Organic Chemistry – A.I.Vogel,
2. A Handbook of Organic Analysis – Clarke andHayes
3. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co.Pvt.
4. N.S.Ganapragasam and G.Ramamurthy, Organic Chemistry – Lab manual, S.Viswanathan Co. Pvt.,
5. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry(Organic), S. Chand and Co.,

Department of Mathematics

Semester I (NEP)

Course Title	Algebra - I and Calculus- I	CIA Marks	40
Course Code	117DSC01T	SEE	60
Scheme (L:T:P)	4:0:0	Credits	04
Teaching Hours	60	Examination Hours	02 1/2

Course Objectives: The course will enable the students to

1. Solve the system of homogeneous and non homogeneous linear equations in m variables by using concept of rank of matrix, finding Eigen values and eigenvectors.
2. Evaluate geometrical representation and problem solving on MVT and Rolls theorems. Identify and apply the intermediate value theorems and L'Hospital rule.
3. Find integration and differentiation of function with real variables.
4. Demonstrate Leibnitz theorem and its applications.

Course Outcome: Students will able to

117DSC01T .1 - Learn to solve the system of homogeneous and non homogeneous linear equations in m variables by using concept of rank of matrix, finding Eigen values and eigenvectors.

117DSC01T .2 - Learn geometrical representation and problem solving on MVT and Rolls theorems. Identify and apply the intermediate value theorems and L'Hospital rule.

117DSC01T .3 - Get familiar with the techniques of integration and differentiation of function with real variables.

117DSC01T .4 - Sketching and Tracing of curves in Cartesian and polar equations.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117DSC01T .1	2	1	-	1	-	-	-	-	-	-	2	1	1
117DSC01T .2	2	1	-	1	-	-	-	-	-	-	2	1	1
117DSC01T .3	2	1	-	1	-	-	-	-	-	-	1	1	1
117DSC01T .4	3	1	-	2	-	-	-	-	-	-	2	1	1

Course content:

Module I :

Matrices: Elementary row and column transformations, Row reduction to Echelon form. Rank of a matrix; Reduction to normal form; Solution of system of linear equations by Gauss Elimination and Gauss-Jordan methods. Condition for existence of non-trivial solutions of homogeneous system of linear equations. Solution of non- homogeneous system of linear equations. Eigenvalues and Eigenvectors of square matrices, real symmetric matrices and their properties, reduction of such matrices to diagonal form, Cayley-Hamilton theorem (without proof), inverse of matrices by Cayley-Hamilton theorem. **15 Hrs**

Module II :

Differentiation in polar Co-ordinates: Polar coordinates, angle between the radius vector and tangent. Angle of intersection of curves (polar forms), Length of perpendicular from pole to the

tangent, pedal equations. Derivative of an arc length in Cartesian, parametric and polar forms, curvature of plane curve-radius of curvature formula in Cartesian, parametric and polar and pedal forms. - center of curvature, Asymptotes, Evolutes and envelops of plane curves. **15 Hrs**

Module III :

Limits and Continuity e-d form(definition only) Differentiability: Definition and Problems, Properties of continuous functions, Intermediate value theorem, Rolles Theorem, Lagranges Mean Value Theorem, Cauchy's Mean Value Theorem. Taylor's theorem (without proof), Taylor's series, Maclaurin's expansions, Indeterminate forms: Evaluation of Limits using L-Hospital rule.**15 Hrs**

Module IV :

Successive Differentiation : nth Derivatives of Standard functions eax+b, (ax + b)n, log(ax + b), sin(ax + b), cos(ax + b), eaxsin(bx + c), eaxcos(bx + c), Leibnitz theorem and its applications. Tracing of Curves (standard curves). 15 Hrs

Teaching pedagogy :

Chalk and talk

Blue print : B.Sc I Semester Scheme/Blue print for paper setting (Max. Marks 60)

Sl. No.	Name of the Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	8 Marks
1.	Module I	15	30	02	02	02
2.	Module II	15	30	02	02	02
3.	Module III	15	30	02	02	02
4.	Module IV	15	30	02	02	02
5.	**Total**	**60**	**120**	**08**	**08**	**08**

B. Sc I

Model Question Paper (Theory)

Time: 2Hrs 30 min **Max.Marks:60**

Instructions: Answer all the questions.

a. Define/Solve any FIVE of the following (Out of 8) 4x2=08
b. Solve any SIX of the following (Out of 8) 4x5=20
c. Solve any THREE of the following (Out of 8) 4x8=32

Reference Books :

1. Allel R.G.A: Basic Mathematics: Macmilan, New Delhi.
2. Dowling, E.T. Mathematics for Economics: Schaum Series, McGraw Hill, London.
3. Soni R.S.: Business Mathematics: Pitamber Publishing House, Delhi
4. N. Rudraiah and Others: College Mathematics for B.Sc Series I and II SBS Publication Co. Bangalore.

Department of Mathematics

Semester I (NEP)

Course Title	Algebra - I and Calculus – I	CIA Marks	20
Course Code	117DSC1P	SEE	30
Scheme (L:T:P)	0:0:2	Credits	02
Teaching Hours	52	Examination Hours	02 1/2

Course Objectives: The course will enable the students to

1. Make use of Free and Open Source Software (FOSS) tools for computer programming
2. Solve problem on algebra and calculus using FOSS softwares.

Course Outcome: Students will able to

117DSC1P.1: Learn Free and Open Source Software (FOSS) tools for computer programming
117DSC1P.2: Solve problem on algebra and calculus using FOSS softwares.
117DSC1P.3: Acquire knowledge of applications of algebra and calculus through FOSS.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117DSC1P.1	2	1	-	1	2	-	-	-	-	1	2	1	1
117DSC1P.2	2	1	-	1	2	-	-	-	-	1	2	2	2
117DSC1P.3	2	1	-	1	2	-	-	-	-	1	2	1	1

Course content :

List of Problems :

Introduction to the software and commands related to the topic.

1. Computation of addition and subtraction of matrices.
2. Computation of Multiplication of matrices.
3. Computation of Trace and Transpose of Matrix
4. Computation of Rank of matrix and Row reduced Echelon form.
5. Computation of Inverse of a Matrix using Cayley-Hamilton theorem.
6. Solving the system of homogeneous and non-homogeneous linear equations.
7. Finding the nth Derivative of e^{ax}, trigonometric and hyperbolic functions
8. Finding the nth Derivative of algebraic and logarithmic functions.
9. Finding the nth Derivative of $e^{ax}\sin(bx+c), e^{ax}\cos(bx+c)$.
10. Finding the Taylor's and Maclaurin's expansions of the given functions.
11. Finding the angle between the radius vector and tangent.
12. Finding the curvatures of the given curves.
13. Tracing of standard curves.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination Scheme for practical examination

❖ Write program	15 marks
❖ Program execution	05 marks
❖ Journal	05 marks
❖ Viva	05 marks
	35 marks

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
4. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company

Department of Mathematics

Semester I (NEP)

Course Title	Business Mathematics-I	CIA Marks	40
Course Code	117OEC01	SEE	60
Scheme (L:T:P)	3:0:0	Credits	03
Teaching Hours	42	Examination Hours	02 1/2

Course Objectives : The course will enable the students to

1. Solve sets, relations, functions in business.
2. Interpret permutations and combinations.
3. Construct matrices in commercial field.
4. Apply trigonometric function in real world

Course Outcome : Students will able to

117OEC01-T.1 - Apply sets, relations, functions in business.
117OEC01-T.2 - Use permutations and combinations.
117OEC01-T.3 - Use matrices in commercial field.
117OEC01-T.4 - Apply trigonometric function in real world.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117OEC01-T.1	2	1	-	2	-	-	-	-	-	-	2	1	2
117OEC01-T.2	2	1	-	1	-	-	-	-	-	-	1	2	1
117OEC01-T.3	2	1	-	1	-	-	-	-	-	-	1	2	2
117OEC01-T.4	3	2	-	2	-	-	-	-	-	-	1	1	1

Course content:

Module I:

Algebra: Sets, relations, functions, indices, logarithms, permutations and combinations,Examples on commercial mathematics. **14 Hrs**

Module II:

Matrices: Definition of a matrix; types of matrices; Algebra of matrices, Determinants, Properties of determinants; calculations of values of determinants up to third order. Adjoint of a matrix, elementary row and column operations; solution of a system of linear equations involving not more than three variables. Examples on commercial mathematics **14 Hrs**

Module III:

Trigonometric Functions: Recapitulation of basic Definitions of trigonometric functions. Signs of trigonometric functions and sketch of their graphs. Trigonometric functions of sum and difference of two angles. Trigonometric ratios of multiple angles (Simple problems). **14 Hrs**

Teaching pedagogy :

Chalk and talk

Blue print: B.Sc I Semester Scheme/Blue print for paper setting (Max. Marks 60)

B. Sc I

Model Question Paper (Theory)

Time: 2Hrs 30 min **Max.Marks:60**

Instructions: Answer all the questions.

a. Define/Solve any FIVE of the following (Out of 8) 4x2=08
b. Solve any SIX of the following (Out of 8) 4x5=20
c. Solve any THREE of the following (Out of 8) 4x8=32

Reference Books:

1. Allel R.G.A: Basic Mathematics: Macmilan, New Delhi.
2. Dowling, E.T. Mathematics for Economics: Schaum Series, McGraw Hill, London.
3. Soni R.S.: Business Mathematics: Pitamber Publishing House, Delhi
4. N. Rudraiah and Others: College Mathematics for B.Sc Series I and II SBS Publication Co. Bangalore.

Department of Mathematics

Semester I (NEP)

Course Title	Scilab	CIA Marks	20
Course Code	117SBC01	SEE	30
Scheme (L:T:P)	0:0:2	Credits	04
Teaching Hours	04	Examination Hours	02 1/2

Course Objectives : The course will enable the students to

1. Understand the Scilab and apply commands in Scilab
2. Make use of looping in Scilab
3. Construct Scilab functions
4. Develop skills to write programme in Scilab

Course Outcome : Students will able to

117SBC01-P.1: Understand the Scilab and apply commands in Scilab
117SBC01-P.2: Use looping in Scilab
117SBC01-P.3: Build Scilab functions
117SBC01-P.4: Plot graphs
117SBC01-P.5: Develop skills to write programme in Scilab

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117SBC01-T.1	2	1	-	2	-	-	-	-	-	-	2	1	2
117SBC01-T..2	2	1	-	1	-	-	-	-	-	-	1	2	1
117SBC01-T..3	2	1	-	1	-	-	-	-	-	-	1	2	2
117SBC01-T..4	3	2	-	2	-	-	-	-	-	-	1	1	1
117SBC01-T..5	2	1	-	1	-	-	-	-	-	-	1	2	1

Course content :

Module I :

Introduction to Scilab, The general environment, The editor, Command Window, graphics window, window management and workspace customization, Variables assignments, display array in terms of matrices and vectors, Displaying output data, data file, Scilab functions. **15 Hrs**

Module II :

Relational and logical operators, Branching Statements and program design, Loops, the while loop, for loop, Tests, 2D and 3D plotting, developing the skills of writing a program Solving differential equations. **15 Hrs**

Teaching pedagogy :

Chalk and talk

Scheme for practical examination Scheme for practical examination

❖ Write program	15 marks
❖ Program execution	05 marks
❖ Journal	05 marks
❖ Viva	05 marks
	35 marks

Reference Books :

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
2. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company

Department of Mathematics

Semester II (NEP)

Course Title	Algebra - II and Calculus - II	CIA Marks	40
Course Code	117DSC02-T	SEE	60
Scheme (L:T:P)	4:0:0	Credits	04
Teaching Hours	60	Examination Hours	02 1/2

Course Objectives: The course will enable the students to

1. Understand the concept of point set topology of real number system and algebra of groups
2. Explain the calculus of multivariable and integration of rational functions.

Course Outcome: Students will able to

117DSC02-T.1: Recognize the countable set and groups.
117DSC02-T.2: Link the fundamental concepts of groups and symmetries of geometrical objects.
117DSC02-T.3: Explain the significance of the notions of Cosets, normal subgroups and factor groups.
117DSC02-T.4: Finding the extreme values of functions and integral values.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117DSC02-T.1	1	1	-	2	-	-	-	-	-	-	1	1	2
117DSC02-T.2	1	1	-	2	-	-	-	-	-	-	1	2	1
117DSC02-T.3	2	2	-	1	-	-	-	-	-	-	1	2	2
117DSC02-T.4	3	2	-	2	-	-	-	-	-	-	2	1	1

Module I :

Real Number System: Countable and uncountable sets-standard theorems. Real line, Bounded sets, supremum and infimum of a set, completeness properties of R, Archimedean property of R. Intervals, neighbourhood of a point, open sets, closed sets, limit points and Bolzano-Weierstrass theorem (without proof). **15 Hrs**

Module II:

Groups : Definition of a group with examples and properties, congruence, problems. Subgroups, center of groups, definition of order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fermat's theorem and Euler's function. **15 Hrs**

Module III :

Multivariate Calculus: Functions of two or more variables, explicit and implicit functions, Partial derivatives of implicit and composite functions. Homogeneous functions- Euler's theorem and its extension. Total differentials, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables. Lagrange's method of undetermined multipliers. **15 Hrs**

Module IV :

Integral Calculus : Integration of algebraic-Rational and irrational functions. integration of rational functions involving trigonometric functions. Definite integrals, properties, standard reduction formula with applications.

Line integral : Definition of line integral and basic properties, examples on evaluation of line integrals. **15 Hrs**

Teaching pedagogy :

Chalk and talk

Blue print: B.Sc I Semester Scheme/Blue print for paper setting (Max. Marks 60)
B. Sc I
Model Question Paper (Theory)

Time: 2Hrs 30 min **Max.Marks:60**

Instructions: Answer all the questions.

a.	Define/Solve any FIVE of the following (Out of 8)	4x2=08
b.	Solve any SIX of the following (Out of 8)	4x5=20
c.	Solve any THREE of the following (Out of 8)	4x8=32

Reference Books :

1. Topics in Algebra- I N Herstain, Wiley Eastern Ltd., New Delhi.
2. Higher algebra - Bernard & Child, Arihant, ISBN: 9350943199/ 9789350943199.
3. Modern Algebra - Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P.
4. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
5. Integral Calculus - Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.,

Department of Mathematics

Semester II (NEP)

Course Title	Algebra -II and Calculus - II	CIA Marks	20
Course Code	117-DSC-02-P	SEE	30
Scheme (L:T:P)	0:0:2	Credits	02
Teaching Hours	52	Examination Hours	02 1/2

Course Objectives : The course will enable the students to

1. Design algorithms for analyze the group and its properties
2. Construct a program to understand the properties of function of two variables

Course Outcome: Students will able to

117-DSC-02-P.1: Learn Free and Open Source Software (FOSS) tools for computer programming
117-DSC-02-P.2: Solve problem on algebra and calculus using FOSS softwares.
117-DSC-02-P.3: Acquire knowledge of applications of algebra and calculus through FOSS.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117-DSC-02-P.1	1	1	-	1	2	-	-	-	-	-	1	1	1
117-DSC-02-P.2	2	1	-	1	2	-	-	-	-	-	2	1	1
117-DSC-02-P.3	1	1	-	1	2	-	-	-	-	-	1	1	1

Content :

List of Programs :

1. Program for verification of binary operations.
2. Program to construct Cayley table and test abelian for given finite set.
3. Program to find all possible cosets of the given finite group.
4. Program to find generators and corresponding possible subgroups of a cyclic group.
5. Programs to verification of Lagrange's theorem with suitable examples.
6. Program to verify the Euler's f function for a given finite group.
7. Program to check homogeneous function.
8. Program to verify the Euler's theorem and its extension.
9. Programs to construct series using Maclaurin's expansion for functions of two variables.
10. Program to evaluate the line integrals with constant and variable limits.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Blue print :

Scheme for practical examination Scheme for practical examination

❖ Write program	15 marks
❖ Program execution	05 marks
❖ Journal	05 marks
❖ Viva	05 marks
	35 marks

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
4. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company

Department of Mathematics

Semester II (NEP)

Course Title	Business Mathematics-II	CIA Marks	40
Course Code	117-OEC-02-T	SEE	60
Scheme (L:T:P)	3:0:0	Credits	03
Teaching Hours	42	Examination Hours	02 1/2

Course Objectives : The course will enable the students to

1. Understand the concept of interest and Annuity in daily life.
2. Explain the concept of Central tendency, correlation and regression

Course Outcome : Students will able to

117-OEC-02-T.1: Integrate concept in business concept with functioning of global trade.
117-OEC-02-T.2: Understand the commercial arithmetic.
117-OEC-02-T.3: Apply decision-support tools to business decision making.
117-OEC-02-T.4: Apply knowledge of business concepts and functions in an integrated manner.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
117-OEC-02-T.1	2	1	-	2	-	-	-	-	-	-	2	1	2
117-OE-C02-T.2	1	1	-	1	-	-	-	-	-	-	1	1	1
117-OEC-02-T.3	1	2	-	1	-	-	-	-	-	-	2	2	1
117-OEC-02-T.4	3	2	-	2	-	-	-	-	-	-	1	1	1

Content :

Module I :

Commercial Arithmetic : Interest: Concept of Present value and Future value, Simple interest, Compound interest, Nominal and Effective rate of interest, Examples and Problems Annuity: Ordinary Annuity, Sinking Fund, Annuity due, Present Value and Future Value of Annuity, Equated Monthly Installments (EMI)by Interest of Reducing Balance and Flat Interest methods, Examples and Problems. **14 Hrs**

Module II :

Measures of central Tendency and Dispersion: Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram and ogive curves. Requisites of ideal measures of central tendency, Arithmetic Mean, Median and Mode forungrouped and grouped data. Combined mean, Merits and demerits of measures of central tendency. Geometric mean: definition, merits and demerits, Harmonic mean: definition, merits and demerits, Choice of A.M., G.M. and H.M. Concept of dispersion, Measures of dispersion: Range, Variance, Standard deviation (SD) forgrouped and ungrouped data, combined SD, Measures of relative dispersion: Coefficient of range, coefficient of variation. Examples and problems. **14 Hrs**

Module III :

Correlation and regression : Concept and types of correlation, Scatter diagram, Interpretation with respect to magnitude and direction of relationship. Karl Pearson's coefficient of correlation for ungrouped data. Spearman's rank correlation coefficient. (with tie and without tie) Concept of regression, Lines ofregression for ungrouped data, predictions using lines of regression. Regression coefficients and their properties (without proof). Examples and problems **14 Hrs**

Teaching pedagogy :

Chalk and talk

Blue print: B.Sc I Semester Scheme/Blue print for paper setting (Max. Marks 60)

B. Sc I

Model Question Paper (Theory)

Time: 2Hrs 30 min **Max.Marks:60**

Instructions : Answer all the questions.

a.	Define/Solve any FIVE of the following (Out of 8)	4x2=08
b.	Solve any SIX of the following (Out of 8)	4x5=20
c.	Solve any THREE of the following (Out of 8)	4x8=32

Reference Books :

1. Practical Business Mathematics S. A. Bari New Literature Publishing Company New Delhi
2. Mathematics for Commerce K. Selvakumar Notion Press Chennai
3. Business Mathematics with Applications Dinesh Khattar& S. R. Arora S. Chand Publishing New Delhi
4. Business Mathematics and Statistics N.G. Das &Dr. J.K. Das McFraw Hill New Delhi
5. Fundamentals of Business Mathematics M. K. Bhowal Asian Books Pvt. Ltd New Delhi
6. Mathematics for Economics and Finance: Methods and Modelling, Martin Anthony and Norman Biggs Cambridge University Press Cambridge

DEPARTMENT OF BOTANY

Semester-I (CBCS)

Course Title	**Microbiology, Algae, Fungi, Archegoniate Origin of Species and Organic evolution**	**CIA Marks**	**30**
Course Code	DSC-Bot-101-T	SEE Marks	70
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	3

Course objectives: This course (DSCBot-101) will enable the students to

1. Explain the role of saprophyte, gametophyte and alternation of generations archegoniate.
2. Identify the types of microorganisms found on food
3. Identify various types of fungus, diseases & its control measures.
4. To know the economic importance of microbes and algae

Course Outcome : After successfully completion of the course, student are able to;

DSC-Bot-101-T.1 - Evaluate the cell structure, life cycle and functions of microorganisms.
DSC-Bot-101-T.2 - dentify types of algae based on morphology and economic importance of algae.
DSC-Bot-101-T.3- Categorize fungal diversity.
DSC-Bot-101-T.4- Differentiate lower to higher forms of plant kingdom.

Mapping of CO with PO and PSO :

CO					**PO**						**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**CBZ**	**CBMB**	**CBBT**
DSC-Bot-101-T.1	3	2	3	2	3	3	1	2	2	1	3	3	3
DSC-Bot-101-T.2	2	3	3	3	3	3	2	1	2	2	3	3	3
DSC-Bot-101-T.3	3	3	3	2	2	3	3	3	3	2	3	3	3
DSC-Bot-101-T.4	3	3	3	3	3	3	3	3	3	1	3	3	3

1. Microbiology: Prions and Viroids **8 hrs**

Viruses : General structure, DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Multiplication; Economic importance of viruses; Bacteria– Archae, Cyanobacteria (Nostoc) and Eubacteria: General characteristics and cell structure; Reproduction - vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

2. Algae: **12 hrs**

General characteristics; distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: Chlamydomonas, Oedogonium, Vaucheria, Sargassum, Battrachospermum. Economic importance of algae

3. Fungi: **12 hrs**

Introduction- General characteristics, range of thallus organization, cell wall composition, nutrition, reproduction and classification;

True Fungi- life cycle of Rhizopus (Zygomycota) Penicillium, Albugo, (Ascomycota), Puccinia, (Basidiomycota);

Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

4. Archegoniates: 1 hrs

Unifying features of archegoniates, Transition to land habit, Alternation of generations.

1. Bryophytes 7 hrs

General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Marchantia and Funaria. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum.

2. Pteridophytes 10 hrs

General characteristics, classification, Early land plants (Lygenopteris and Rhynia). Classification (up to family), morphology, anatomy and reproduction of Selaginella, Equisetum and Nephrolepis. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

3. Gymnosperms 7 hrs

General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of Cycas and Pinus. (Developmental details not to be included). Ecological and economical importance.

5. Origin of species (Chemical theory of evolution) and Organic evolution (Neo-Darwinism) 3 hrs

Teaching Pedagogy:

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1.	Microbiology	8	14	01/02	1 or 2	0 or1	15
2.	Algae	12	21	01	02	01	22
3.	Fungi	12	21	01	02	01	22
4.	Introductioin to Archegoniates and						
	Bryophytes	8	14	01/02	1 or 2	0 or1	14
5.	Pteridophytes	10	17	01	01	01	17
6.	Gymnosperms, Origin of species and Organic evolution	10	17	01/02	1 or 2	0 or 1	17
7.	**Total**	**60**	**104**	**07**	**08**	**05**	

MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I.	Define/ Write a note on any FIVE of the following (Out of 7)	5 X 2 = 10
II.	Answer / Explain any SIX of the following (Out of 8)	6 X 5 = 30
III.	Answer / Describe in detail any THREE of the following (Out of 5)	3 X10 = 30

Reference Book :

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad
9. G. M. Smith. A textbook of Cryptogamic Botany (Vol. I & II)
10. Ganguli Das, Datta and Kar. College Botany

Course Title	Microbiology, Algae, Fungi, Archegoniate Origin of Species and Organic evolution Practical	CIA Marks	15
Course Code	DSC-Bot-101-P	SEE Marks	35
Scheme (L:T:P)	0:0:2	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives : This course (DSCBot-101) will enable the students to

1. Explain the role of saprophyte, gametophyte and alternation of generations archegoniate.
2. Identify the types of microorganisms found on food
3. Identify various types of fungus, diseases & its control measures.
4. To know the economic importance of microbes and algae

Course Outcome : After successfully completion of the course, student are able to;

DSC-Bot-101-P.1- Identify and study the replication of Viruses.
DSC-Bot-101-P.2- Recognize and distinguish the vegetative and reproductive structures of algae.
DSC-Bot-101-P.3- Examine and sketch fungi.
DSC-Bot-101-P.4- Evaluate the identification skills of different lower to higher plant transition forms.

Mapping of CO with PO and PSO :

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSC-Bot-101-P.1	3	1	2	3	3	3	-	3	-	2	3	3	3
DSC-Bot-101-P.2	3	3	3	3	3	3	2	3	-	2	3	3	3
DSC-Bot-101-P.3	3	3	3	3	2	1	-	3	-	2	3	3	3
DSC-Bot-101-P.4	3	3	3	3	3	3	2	3	-	2	3	3	3

Practical No. 1 :

a) EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle;

b) Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule and

c) Gram staining

Practical No. 2: Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), Oedogonium, Vaucheria,

Practical No. 3: Study of vegetative and reproductive structures of Sargassum and Battrachopsermum through temporary preparations and permanent slides. (Specimen and permanent slides).

Practical No. 4:

a) Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides.

b) Albugo: Specimens/photographs and tease mounts.

Practical No. 5 :

a) Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves;section/tease mounts of spores on Wheat and permanent slides of both the hosts.

b) Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)

c) Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)

Practical No. 6:

a) Marchantia- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup,w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).

b) Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporaryslides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.

Practical No. 7:

a) Selaginella- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophylland megasporophyll (temporary slides), l.s. strobilus (permanent slide).

b) Equisetum- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m.spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).

Practical No. 8:

a) Nephrolepis - morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporaryslides), w.m. prothallus with sex organs and young sporophyte (permanent slide).

b) Cycas- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).

Practical No. 9 :

a) Pinus- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. &r.l.s. stem (permanent slide).

b) Study of fossils:Lygenopteris and Rhynia

Practical No. 10: Revision

Teaching Pedagogy:

Live demonstration of mounting the specimens, sectioning, staining

Q: I	Identify and classify giving two reasons of the specimen A, B,C, D, E & F	**2 X 6 = 12**
Q: II	Stain and mount the given material 'G' for bacteria and show the preparation to examiner	**3 X 1= 03**
Q:III	Mount _____from the given material 'H'	**3 X 1= 03**
Q:IV	Identify and comment on the given slides/specimen I, J, K,L & M	**2 X 5 = 10**
	Journal	**= 04**
	Submission	**=03**

Scheme of Valuation :

I. Identification = ½ mark & Classifications with reasons = 1½ mark
II. Staining and mounting =03 marks
III. Expose _____ of algae, fungi, bryophyte, pteridophytes and gymnosperm (like thallus, sex organs, antheredial head of funaria, etc) = 03 marks
IV. Identification =½, Comments = 1½ (I- from algae, J- from Fungi, K- from bryophytes, L- from pteridophytes, Fossiles and M- from gymnosperms) =10
V. Journal 04 marks
Submission of materials of algae, bryophyte, pteridophytes and gymnosperms. = 03 marks

Reference Books :

1. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad

Semester-II (CBCS)

Course Title	Plant Ecology and Taxonomy	CIA Marks	30
Course Code	DSC-Bot-202 -T	SEE Marks	70
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	3

Course objectives : This course (DSCBot-202) will enable the students to

1. study the world's flora
2. provide a method for identification and nomenclature
3. provide Latin scientific name for every group of plants in the world.
4. The inter-relationship between organism in population and communities

Course Outcome : After successfully completion of the course, student are able to;

DSC-Bot-202-T.1- Interpret core concepts of biotic and abiotic factors and Plant communities
DSC-Bot-202-T.2- Assemble the plants based on systematic classification.
DSC-Bot-202-T.3- Execute the concepts of Ecosystem and Biogeochemical cycles
DSC-Bot-202-T.4- Recognize the Phytogeographical division of India and Forest types

Mapping of CO with PO and PSO :

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSC-Bot-202-T.1	2	3	3	3	3	3	3	3	3	2	3	3	3
DSC-Bot-202-T.2	3	3	3	2	3	3	3	2	3	2	3	3	3
DSC-Bot-303-T.3	3	3	3	3	3	3	3	3	3	3	3	3	3
DSC-Bot-404-T.4	3	3	3	3	3	3	3	3	3	3	3	3	3

1. Ecological factors **10 hrs**

Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes, xerophytes and halophytes

2. Ecosystem **8 hrs**

Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous

3. Plant communities **5 hrs**

Characters; Ecotone and edge effect; Succession; Processes and types.

4. Phytogeography **6 hrs**

Principle biogeographical zones; Endemism, Forest types with reference to India and Karnataka

5. Introduction to plant taxonomy, hierarchy and Botanical nomenclature **10 hrs**

Identification and Nomenclature; Classification, Ranks, categories and taxonomic groups. Principles and rules (ICN); binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations. Importance of Herbarium, Digitalization of herbarium important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access.

6. Classification **4 hrs**

Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).

7. Biometrics, numerical taxonomy and cladistics **3 hrs**

Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).

8. Taxonomic evidences **4 hrs**

Palynology, cytology, phytochemistry and molecular data

9. Families **10 hrs**

Malvaceae, Brassicaceae, Rutaceae, Leguminosae,Umbelliferae, Rubiaceae, Sapotaceae, Asteraceae, Asclepiadaceae, Solanaceae , Lamiaceae , Euphorbiaceae, Amaranthaceae, Liliaceae, Poaceae, Arecaceae

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Ecological factors	10	17	01	01	01	17
2	Ecosystem and Plant communities	13	24	02	02	01	24
3	Phytogeography	6	10	--	01/02	00/01	10
4	Introduction to plant taxonomy, hierarchy and Botanical nomenclature	10	19	02	01	01	19
5	Classification, Biometrics, numerical taxonomy and cladistics and Taxonomic evidences	11	17	01	01	01	17
	Families	10	17	01	01	01	17
	Total	**60**	**104**	**07**	**08**	**05**	**104**

MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 = 10
II. Answer / Explain any SIX of the following (Out of 8) 6 X 5 = 30
III. Answer / Describe in detail any THREE of the following (Out of 5) 3 X10 = 30

Reference Book :

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.

4. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rdedition.
5. Mondal A. K. Advanced Taxonomy
6. Sutaria, Textbook of plant Taxonomy
7. Odum E. P. Text Book of Ecology
8. Shukla and Chandel, Plant Geography

Course Title	Plant Ecology and Taxonomy Practical	CIA Marks	15
Course Code	DSC-Bot-202 -P	SEE Marks	35
Scheme (L:T:P)	0:0:2	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives : This course (DSCBot-202) will enable the students to

1. Identify and classify plants of different angiosperm families.
2. Use practical knowledge for preparation of value-added edible plant products
3. To highlight the economic importance of plants.
4. To evaluate the importance of ecology and types of vegetation.

Course Outcome : After successfully completion of the course, student are able to;

DSC-Bot-202-P.1- Estimate experiments on different parameters of various soil samples.
DSC-Bot-202-P.2- Identify and enhance identification skills to measure microclimatic variables.
DSC-Bot-202-P.3- Plan and organize study of herbaceous vegetation.
DSC-Bot-202-P.4- Sketch and categorize plant systematic classification.

Mapping of CO with PO and PSO :

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSC-Bot-202-P.1	3	3	3	3	3	3	3	3	2	3	3	3	3
DSC-Bot-202-P.2	3	3	3	3	3	3	2	3	-	3	3	3	3
DSC-Bot-202-P.3	3	3	3	3	3	3	3	2	-	3	3	3	3
DSC-Bot-202-P.4	3	3	3	3	3	3	3	2	-	3	3	3	3

Practical No. 1 : Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.

Practical No. 2: Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.

Practical No. 3 : (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b)Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanche), Epiphytes, Predation (Insectivorous plants)

Practical No. 4 : Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (Species to be listed) and Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law

Practical No. 5 : Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Malvaceae, Brassicaceae, Rutaceae,

Practical No. 6 : Leguminosae,Umbelliferae, Rubiaceae,

Practical No. 7 : Sapotaceae, Asteraceae, Asclepiadaceae,

Practical No. 8 : Solanaceae, Lamiaceae , Euphorbiaceae,

Practical No. 9 : Amaranthaceae, Liliaceae, Poaceae, Arecaceae (in 5 practicals)

Practical No.10 : Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Teaching Pedagogy :

Live demonstration of mounting the specimens, sectioning, staining

Q .I. Identify and classify the specimens A, B, and C to their respective family giving reasons. 3x3=09 Marks

Q.II. Draw the floral diagram and write the floral formula of specimen D. 1x2= 02 Marks

Q.III Write a note on account of Ecological adaptations found in specimen E&F. Mention their habitats. 4 x 2= 08 Marks

Q.IV. Estimate or determine ---------- of the sample 2x1=02Marks

Q V. Identify and comment on the Ecological interest found in the specimen /slide H&I 2x2= 04 Marks

QVI. Identify and comment on the working mechanism involved in the instruments J 1x2= 02 Marks

Journal…… 04 Marks

Tour Report…& Viva voce…… 04Marks

Scheme of Valuation :

Q .I. Identify and classify the specimens A, B, and C to their respective family giving reasons. 3x3=09 Marks

A,B,C- Identification- 1 mark, diagnostic characters- 2 marks

Q.II. Draw the floral diagram and write the floral formula of specimen D. 1x2= 02 Marks

Floral diagram- 1 ½ mark, floral marks- ½ mark

Q.III Write a note on account of Ecological adaptations found in specimen E&F. Mention their habitats. 4 x 2= 08 Marks

E, F- Identify the habitat- ½ mark, Diagram- 1 ½ marks, morphological,anatomical, physiological characters- 2 marks

Q.IV. Estimate or determine ---------- of the sample 2x1=02Marks

pH, carbonates- estimation and procedure- 1 ½ marks, results- ½ mark

Q V. Identify and comment on the Ecological interest found in the specimen /slide H&I 2x2= 04 Marks

H, I- Identification- ½ marks, Comment- 1 ½ marks

QVI. Identify and comment on the working mechanism involved in the instruments J 1x2= 02 Marks

J- Identification- ½ mark, working- 1 ½ mark

Journal…… 04 Marks

Tour Report…& Viva voce…….....… 04Marks

Reference Books :

1. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
2. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.

DEPARTMENT OF BOTANY

Semester-I (NEP)

Course	Title Fungi, Microbiology and Plant Pathology	CIA Marks	40
Course Code	118DSC-01 T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	2 ½

Course objectives: This course (118DSC-01) will enable the students to

1. Identify the types of microorganisms found on food
2. Define fungi and discuss its reproductive nature
3. Identify various types of fungal diseases and its control measures
4. Learn about the beneficial & harm full microorganisms.

Course Outcome: After successfully completion of the course, student are able to;

118DSC- 01-T.1- explain Life cycle of different types of fungi
118DSC- 01-T.2- value symbiotic organisms-Microbes, Fungi and Lichens & their economic importance.
118DSC- 01-T.3- interpret the cell structure, life cycle & functions of microorganisms.
118DSC- 01-T.4- differentiate plant diseases& its control measures.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118DSC- 01-T.1	3	2	3	3	2	3	2	3	2	3	3	3	3	3
118DSC- 01-T.2	3	2	3	3	2	3	2	3	2	3	3	3	3	3
118DSC- 01-T.3	3	2	3	3	2	3	3	3	1	3	3	3	3	3
118DSC- 01-T.4	3	2	3	3	2	3	3	3	1	3	3	3	3	3

Unit I: Introduction to fungi and classification **10 hrs**

General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition;Classification(Alexopoulos).

Chytridiomycota, Oomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Phytophthora, Albugo and Rhizopus .

Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Penicillium, Alternaria.

Unit II: Basidiomycota, Allied fungi and Oomycota **10 hrs**

General characteristics; Ecology; Life cycle and Classification of Puccinia and Agaricus, Mushroom Cultivation.

Allied fungi : General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.

Unit III: Symbiotic associations and applied Mycology **9 hrs**

Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization and Reproduction.

Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance. Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins).

Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical Mycology.

Unit IV: Introduction to microbial world **9 hrs**

Microbial nutrition, nutritional types, growth and metabolism. Economic importance of viruses with reference to vaccine production. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).

Unit V: Viruses and Bacteria **9 hrs**

General characteristics; classification (Baltimore), structure and multiplication of DNA virus (T4 and ?), lytic and lysogenic cycle; RNA virus (TMV), viroids and prions. General characteristics; Archaebacteria, Eubacteria, wall-less forms (mycoplasmas); Cell structure; Reproduction and recombination (conjugation, transformation and transduction). Binary fission and endospore.

Unit VI: Phytopathology **9 hrs**

Introduction, general symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.

Bacterial diseases – Citrus canker and angular leaf spot of cotton.

Viral diseases – Tobacco Mosaic viruses,vein clearing.

Fungal diseases – Late blight of potato, Black stem rust of wheat, White rust of crucifers

Teaching Pedagogy:

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

Unit	Topic	Hours	Marks	A	B	C
I	Introduction to fungi and classification	10	18	01	01	00/01
II	Basidiomycota, Allied fungi and Oomycota	10	18	01	01	00/01
III	Symbiotic associations and applied Mycology	09	23	01/02	01/02	01/02
IV	Introduction to microbial world	09	23	01/02	01/02	01/02
V	Viruses and Bacteria	09	23	01/02	01/02	01/02
VI	Phytopathology	09	23	01/02	01/02	01/02
		56 hours		**6**	**7**	**4**

SEMESTER END EXAMINATION

Subject: **Semester:**
Course Title: **Duration: 2 ½ hrs**
Course Code: **Max Marks: 60**
Question. No.

Instructions: 1) Answer two FULL QUESTIONS.
2) Use of Calculator permitted.

			Marks	CO	BTL
		PART-A			
1.	a)		2		
	b)		5		
	c)		8		
		OR			
2.	a)		2		
	b)		5		
	c)		8		
		PART-B			
3.	a)		2		
	b)		5		
	c)		8		
		OR			
4.	a)		2		
	b)		5		
	c)		8		
		PART- C			
5.	a)		2		
	b)		5		
	c)		8		
		OR			
6.	a)		2		
	b)		5		
	c)		8		
		PART- D			
7.	a)		2		
	b)		5		
	c)		8		
		OR			
8.	a)		2		
	b)		5		
	c)		8		

Reference Books :

1. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology. 4th edition.John Wiley & Sons (Asia) Singapore.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
6. Wiley, J.M, Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw Hill International.
7. Sharma T.A., Dubey, R.C. and Maheshwari, D.K. (1999). A Text Book of Microbiology. S Chand and Co, New Delhi.
8. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
9. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

Course Title	Fungi, Microbiology and Plant Pathology Practical	CIA Marks	20
Course Code	118DSC-01-P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives: This course (118DSC-01-) will enable the students to

1. Identify vegetative and reproductive structures Rhizopus, Penicillium, Alternaria and Peziza.
2. Learn to identify plant diseases.
3. Perform Gram-staining technique.
4. Recognize the symptoms of plant bacterial and viral diseases.

Course Outcome: After successfully completion of the course, student are able to;

118DSC- 01- P.1- explain Life cycle of different types of fungi.
118DSC- 01- P.2- interpret different methods in the use of symbiotic organisms.
118DSC- 01- P.3- identify and study the replication of Viruses.
118DSC- 01- P.4- examine and sketch fungi.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118DSC- 01-P.1	3	3	2	1	3	3	2	3	3	2	3	3	3	3
118DSC- 01- P.2	3	3	2	2	3	3	2	3	3	2	3	3	3	3
118DSC- 01- P.3	3	2	3	3	3	3	2	3	3	2	3	3	3	3
118DSC- 01- P.4	3	2	3	3	3	3	2	3	3	2	3	3	3	3

1. Rhizopus, Penicillium, Alternaria and Peziza - Study of vegetative and reproductive structures from temporary mounts/permanent slides/photographs
2. Phytophthora infestnas and Albugo. Study of vegetative and reproductive structures from temporary mounts/permanent slides/photographs.
3. Puccinia and Agaricus: Study of vegetative and reproductive structures from temporary mounts/permanent slides/photographs(2 practicals)
4. Lichens: Study of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs).
5. Electron micrographs/Models of viruses – T4 and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle.
6. Gram-staining technique (By using root nodule and curd).
7. Phytopathology: Herbarium and live specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifer.

Teaching Pedagogy:

Live demonstration of mounting the specimens, sectioning, staining

Q I	Identify and classify giving three reason of the specimen A, B, C	3 x 3 = 09
Q II	Gram Staining of Bacteria "D"	5 = 05
Q III	Comment on disease in the given specimen E & F	2 x 3 = 06
Q. IV	Identify and comment on the slide/ specimen / Chemical G H, & I	03x2= 06
	Journal…….……	= 04

Scheme of Valuation

Q. I	Identify and classify giving three reason of the specimen A, B, C	3 x 3 = 09
	Each carries …..03 marks	
	Identification……	0.5
	Classification……..……	01
	Reasons……	1.5
Q II	Gram Staining of Bacteria "D"	1 x 5 = 05
	List of reagents.....	01
	Procedure.....	02
	Slide Preparation.....	01
	Identification.....	01
Q III	Comment on disease in the given specimen E & F	2 x 3 = 06
	Each carries…….	03 marks
	Name of the disease……	01
	Name of the Pathogen & Host ……	01
	Symptoms of the disease……..……	01
Q. IV	Identify and comment on the slide/ specimen / Chemical G H, & I	03x2= 06
		Each carries 2 marks.
	Identification.....	0.5
	Reasons.....	1.5
	Journal……	= 04

Reference Books :

1. Wiley, J.M, Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw Hill International.
2. Sharma T.A., Dubey, R.C. and Maheshwari, D.K. (1999). A Text Book of Microbiology. S Chand and Co, New Delhi.
3. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
4. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

Semester-I (NEP)

Course Title	Mushroom Cultivation	CIA Marks	40
Course Code	118OEC-01-T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	2 ½

Course objectives : This course (118OEC-01-T) will enable the students to

1. strengthen the promotion of mushroom cultivation by establishing a well-equipped laboratory.
2. help create new employment opportunities for rural women and the youth through mushroom cultivation.
3. empower rural communities with entrepreneurial skills through the production.
4. ensure adequate and satisfactory supply of spawn to rural communities involved in mushroom production.

Course Outcome: After successfully completion of the course, student are able to;

118 OEC – 01-T.1- identify the various types of and categories of Mushrooms
118 OEC – 01-T.2- explain varies types of cultivating techniques.
118 OEC – 01-T.3- compare the value of nutrition in Mushroom.
118 OEC – 01-T.4- illustrate the Mushroom storage Food preparation.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118 OEC – 01-T.1	3	2	3	3	2	3	3	3	2	3	3	3	3	3
118 OEC – 01-T.2	3	2	3	3	2	3	3	3	2	3	3	3	3	3
118 OEC – 01-T.3	3	2	3	3	2	3	3	3	2	3	3	3	3	3
118 OEC – 01-T.4	3	2	3	3	2	3	3	3	3	3	3	3	3	3

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

Unit 1: Introduction **11 hrs**

Introduction, history. Nutritional and medicinal value of edible mushrooms; Nutrition and nutraceuticals – Proteins, amino acids, mineral elements nutrition, carbohydrates, crude fibre content, vitamins; Poisonous mushrooms.

Unit 2: Cultivation Technology: **10 hrs**

Infrastructure : substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, Sterilization, Preparation of spawn, Multiplication.

Unit 3: Cultivation **10 hrs**

Cultivation practices of Agaricus bisporus, Pleurotus sp. and Volvoriella volvacea. Composting technology in mushroom production, Low cost technology, Mushroom bed preparation - paddy

straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation.

Unit 4: Storage and Food preparation: 11 hrs

Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in salt solutions.

Food Preparation : Types of foods prepared from mushroom. Research Centres -National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value

Blue print :

Unit	Topic	Hours	Marks	A	B	C
I	Introduction	11	17	01	01/02	01/02
II	Cultivation Technology	10	17	01/02	01/02	01
III	Cultivation	10	17	01/02	01/02	01
IV	Storage and Food preparation:	11	17	01/02	01/02	01
		42hours		**6**	**7**	**4**

SEMESTER END EXAMINATION

Subject: **Semester:** **Course Title:**
Duration: 2 ½ hrs **Course Code:** **Max Marks: 60**
Question. No.

Instructions: 1) Answer two FULL QUESTIONS. 2) Use of Calculator permitted.

			Marks	CO	BTL
		PART-A			
1.	a)		2		
	b)		5		
	c)		8		
		OR			
2.	a)		2		
	b)		5		
	c)		8		
		PART-B			
3.	a)		2		
	b)		5		
	c)		8		
		OR			
4.	a)		2		
	b)		5		
	c)		8		
		PART- C			
5.	a)		2		
	b)		5		
	c)		8		
		OR			
6.	a)		2		
	b)		5		
	c)		8		
		PART- D			
7.	a)		2		
	b)		5		
	c)		8		
		OR			
8.	a)		2		
	b)		5		
	c)		8		

Reference Books :

1. Biswas, S., Datta, M. and Ngachan, S.V. 2012. Mushrooms: A Manual for Cultivation. PHI Learning Private Limited, New Delhi.
2. Kapoor, J.N. 2010. Mushroom Cultivation. ICAR, New Delhi.
3. Nita Bahl (2000) Hand book of Mushrooms. Oxford & IBH Publishing Co. Pvt. Ltd.
4. Singh, M., Vijay, B., Kamal, S. and Wakchaure (Eds.) 2011. Mushrooms: Cultivation, Marketting and Consumption. Directi\orate of Mushroom Reseaerch (ICAR), Solan
5. Tewari, Pankaj and Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi

Semester-I

Course Title	Gardening and landscaping Practical	CIA Marks	20
Course Code	118SBC-01-P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	30	Examination Hours	3

Course objectives: This course (SBC-01) will enable the students to

1. Learn the basics of gardening and nursery techniques.
2. Gain knowledge on the types of the garden.
3. Learn the maintenance of the plants.

Course Outcome: After successfully completion of the course, student are able to;

118SBC-01-P.1- recognize and distinguish the vegetative and reproductive structures of algae.
118SBC-01-P.2- practice the identification of lower plant forms.
118SBC-01-P.3- compare the life cycle patterns of Gymnosperms and Bryophytes.
118SBC-01-P.4- revise the economic importance of Algae, Bryophytes, Pteridophytes & Gymnosperms.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118SBC-01-P.1	3	2	2	3	3	2	3	3	2	3	3	3	3	3
118SBC-01-P.2	3	3	3	2	3	2	3	3	2	3	3	3	3	3
118SBC-01-P.3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
118SBC-01-P.4	3	3	3	2	3	3	3	3	3	3	3	3	3	3

Theory

Unit I

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges,constructed features. Greenhouse. Special types of gardens, trees, their design, values inlandscaping, propagation, planting shrubs and herbaceous perennials. Importance, designvalues, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents

Unit II

Flower arrangement: importance, production details and cultural operations, constraints, postharvest practices. Bioaesthetic planning, definition, need, round country planning, urbanplanning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds

Unit III

Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Landscape designs, Styles of garden, formal, informal and free style gardens, types of

gardens, Urban landscaping, Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, damsites, IT parks, corporate.

Practicals

1. Tools, implements and containers used for propagation and nursery techniques.
2. Propagation by cutting, layering, budding and grafting.
3. Seed propagation - preparation of portable trays, seed treatments, sowing and seedling production.
4. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti and succulents.
5. Planning and designing of gardens, functional uses of plants in the landscape.
6. Preparation of land for lawn and planting.
7. Identification of commercially important flower crops and their varieties.
8. Propagation practices in flower crops, sowing of seeds and raising of seedlings of annuals.
9. Use of chemicals and other compounds for prolonging the vase life of cut flowers.
10. Grading, packing and marketing of cut flowers.
11. Visit to commercial nurseries and commercial tissue culture laboratory.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

PRACTICAL QUESTION PAPER

TIME: 3 Hours	**Max Marks: 30 Marks**
1. Identify and describe the uses of tools A & B	6 Marks
2. Perform experiment C– Seed viability/Seed germination	6 Marks
3. Identification of specimen D, E, F	9 Marks
4. Study tour report	3 Marks
5. Viva	3 Marks
6. Journal	3 Marks

Reference Books :

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
3. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.
4. Hartmann and Kester, 2010. Plant Propagation: Principles and Practices. Pearson Publisher.
5. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.
6. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
7. Thakur, A.K., Kashyap, B., Bassi, S.K. and Sharma, M. 2018. Floriculture. S. Dinesh & Co., Jalandhar.

Semester-II

Course Title	Algae, Bryophytes, Pteridophytes and Gymnosperms	CIA Marks	40
Course Code	118DSC-02-T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	2 ½

Course objectives: This course (118DSC-02T) will enable the students to

1. To develop skills in identifying and handling various plant specimens.
2. Develop basic skills in handling and sectioning of plant specimens.
3. Understand the morphological and anatomical features of pteridophytes and gymnosperms.

Course Outcome: After successfully completion of the course, student are able to;

118DSC-02-T.1- recognize and distinguish the vegetative and reproductive structures of algae.
118DSC-02-T.2- practice the identification of lower plant forms.
118DSC-02-T.3- compare the life cycle patterns of Gymnosperms and Bryophytes.
118DSC-02-T.4- revise the economic importance of Algae, Bryophytes, Pteridophytes & Gymnosperms.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118DSC-02-T.1	3	2	2	3	3	3	3	2	3	3	3	3	3	3
118DSC-02-T.2	3	2	2	3	3	3	3	2	3	3	3	3	3	3
118DSC-02-T.3	3	2	2	3	3	2	3	2	3	3	3	3	3	3
118DSC-02-T.4	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Unit I: Algae, Cyanophyta and Xanthophyta **12 h/lectures**

Unifying features, Life history of algae, commonly found algae of India, Classification (by Fritsch), Algal cultivation methods, Algal cell structure, Phylogenetic systematics of Dinoflagellates, Cryptomonads and other unicellular algae, Diatoms, green, yellow, brown and red algae. Algal evolution, Algal bioprospecting. Ecology and occurrence; Cell structure; Morphology and reproduction of Nostoc and Vaucheria.

Unit II: Chlorophyta, Phaeophyta and Rhodophyta **11 h/lectures**

General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycles of green algae- Volvox, Oedogonium and Chara. Brown algae – Ectocarpus, and red algae- Batrachospermum. Red tides and other algal adaptations. Commercial cultivation and economic importance of algae.

Unit III: Bryophytes **11 h/lectures**

Unifying features, adaptations to land habit; Alternation of generations.

General characteristics; Classification (Smith); Range of thallus organization. Morphology, anatomy, reproduction and evolutionary trends in Riccia, Marchantia, Anthoceros and Funaria.

Common mosses of India, Ecological and economic importance of bryophytes with special reference to Sphagnum.

Unit IV: Pteridophytes **11 h/lectures**

Unifying features, classification (Smith), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Marselia. Stelar evolution. Apogamy and apospory, heterospory and seed habit. Common ferns of India, Ecological and economic importance.

Unit V: Gymnosperms **11 h/lectures**

Unifying features, classification (Smith), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum. Ecological and economic importance.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

Unit	Topic	Hours	Marks	A	B	C
I	Algae, Cyanophyta and Xanthophyta	12	31	02/03	02/03	02/01
II	Chlorophyta, Phaeophyta and Rhodophyta	11	17	01	01/02	01
III	Bryophytes	11	17	01	01	01
IV	Pteridophytes	11	17	01	01	01
V	Gymnosperms	11	17	01	01	01
		56hours		**6**	**7**	**4**

SEMESTER END EXAMINATION

Subject: **Semester:** **Course Title:**
Duration: 2 ½ hrs **Course Code:** **Max Marks: 60**
Question. No.

Instructions: 1) Answer two FULL QUESTIONS. 2) Use of Calculator permitted.

			Marks	CO	BTL
		PART-A			
1.	a)		2		
	b)		5		
	c)		8		
		OR			
2.	a)		2		
	b)		5		
	c)		8		
		PART-B			
3.	a)		2		
	b)		5		
	c)		8		
		OR			
4.	a)		2		
	b)		5		
	c)		8		
		PART- C			
5.	a)		2		
	b)		5		
	c)		8		
		OR			
6.	a)		2		
	b)		5		
	c)		8		
		PART- D			
7.	a)		2		
	b)		5		
	c)		8		
		OR			
8.	a)		2		
	b)		5		
	c)		8		

Reference Books:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Vashishta B.R., Sinha A.K. and Singh V. P. (2008). Botany for Degree Students. Algae. S Chand and Co, New Delhi.
3. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.

4. Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky P.V. and Jackson, R.B. (2008). Biology, 8th edition. Pearson Benjamin Cummings, USA.
5. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
6. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International Publishers, New Delhi, India.
7. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot, Allahabad.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, New Delhi.
9. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to Bryophytes. Cambridge University Press, Cambridge

Course Title	Algae, Bryophytes, Pteridophytes and Gymnosperms Practical	CIA Marks	40
Course Code	118DSC-02-P	SEE Marks	60
Scheme (L:T:P)	0:0:4	Credits	4
Teaching Hours	40	Examination Hours	4

Course objectives: This course (118DSC-02) will enable the students to

1. To develop skills in identifying and handling various plant specimens.
2. Develop basic skills in handling and sectioning of plant specimens.
3. Understand the morphological and anatomical features of pteridophytes and gymnosperms.

Course Outcome: After successfully completion of the course, student are able to;

118DSC-02-P.1- recognize and distinguish the vegetative and reproductive structures of algae.
118DSC-02-P.2- practice the identification of lower plant forms.
118DSC-02-P.3- compare the life cycle patterns of Gymnosperms and Bryophytes.
118DSC-02-P.4- revise the economic importance of Algae, Bryophytes, Pteridophytes & Gymnosperms.

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118DSC-02-P.1	2	3	3	3	3	3	3	3	2	3	3	3	3	3
118DSC-02-P.2	2	3	3	3	2	3	2	3	3	2	3	3	3	3
118DSC-02-P.3	2	3	2	3	2	3	3	2	3	2	3	3	3	3
118DSC-02-P.4	2	3	2	3	3	3	3	3	3	2	3	3	3	3

1. Microscopic observation of vegetative and reproductive structures of Nostoc, Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus and Batrachospermum through temporary preparations and permanent slides (3 practicals).
2. Riccia, Marchantia, Anthoceros and Funaria- Study of vegetative and reproductive structures (through material/permanent slides) (3 practicals).
3. Psilotum, Selaginella, Equisetum and Marselia- Study of vegetative and reproductive structures (through material/permanent slides) (3 practicals).
4. Cycas, Pinus and Gnetum - Study of vegetative and reproductive structures (through material/permanent slides)(3practicals).
5. Compulsory study tour (Students should submit tour report and field notebook at the time of practical exams)

Teaching Pedagogy :

Live demonstration of mounting the specimens, sectioning, staining

Q 1.	Identify and classify giving reasons of the specimen/material A, B, C, D	3 x 4 = 12
Q 2.	Mount the given material E and show the preparation to examiner	3
Q 3.	Identify and Comment on slide/ specimen F,G,H, I	4 x 2 = 8
	Field visit	2
	Tour report	2
	Journal	3

Scheme of Valuation

Q 1.	Identify and classify giving reasons of the specimen/material A, B, C, D	3 x 4 = 12
	Identification- ½	
	Classification- 1	
	Reasons- 1 ½	
Q 2.	Mount the given material E and show the preparation to examiner	3
	Identification- ½	
	Slide preparation- 1	
	Diagram- 1 ½	
Q 3.	Identify and Comment on slide/ specimen F,G,H, I	4 x 2 = 8
	Identification- ½ mark	
	Reasons- 1½	
	Field visit	2
	Tour report	2
	Journal	3

Reference Books :

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Vashishta B.R., Sinha A.K. and Singh V. P. (2008). Botany for Degree Students. Algae. S Chand and Co, New Delhi.
3. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
4. Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky P.V. and Jackson, R.B. (2008). Biology, 8th edition. Pearson Benjamin Cummings, USA.
5. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
6. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International Publishers, New Delhi, India.
7. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot, Allahabad.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, New Delhi.
9. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to Bryophytes. Cambridge University Press, Cambridge

Semester-II

Course Title	Biofertilizers	CIA Marks	40
Course Code	118OEC-02-T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	2 ½

Course objectives: This course (118OEC-02) will enable the students to

1. Students understand the general account of microbes used as biofertilizers.
2. Students able to describe the Azolla cultivation.
3. Students gain knowledge about types of mycorrhizal association, taxonomy, occurrence and distribution.
4. Students to distinguish degradable and non- degradable wastes.

Course Outcome: After successfully completion of the course, student are able to;

118OEC-02-T.1- summarize the understanding of the coverage of biofertilizers.
118OEC-02-T.2- identify the different forms of biofertilizers and their uses.
118OEC-02-T.3- explain the better crop production by using nitrogeneous,phosphate biofertilizers and VAM.
118OEC-02-T.4- evaluate the importance of biofertilizers in agriculture

Mapping of CO with PO and PSO :

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118OEC-02-T.1	3	3	2	3	3	3	2	2	2	3	3	3	3	3
118OEC-02-T.2	3	3	2	3	3	3	2	3	1	3	3	3	3	3
118OEC-02-T.3	3	3	2	3	3	3	2	3	1	3	3	3	3	3
118OEC-02-T.4	3	3	3	3	3	3	3	3	3	2	3	3	3	3

Unit I **11 h/lectures**

General account of microbes used as biofertilizers – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

Azospirillum : isolation and mass multiplication – carrier based inoculant, synergistic effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.

Unit II **10 h/lectures**

Cyanobacteria (blue green algae), Azolla and Anabaena association, nitrogen fixation, factors affecting cultivation of Azolla. Blue green algae and Azolla in rice cultivation.

Unit III **10 h/lectures**

Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of AMF – isolation and inoculum production of AMF, Phosphate solubilizing bacteria(PSB) and its influence on growth and yield of crop plants.

Unit IV **11 h/lectures**

Organic farming – Green manuring and organic fertilizers, Recycling of bio- degradable wastes-municipal, agricultural and Industrial. Biocompost making methods, types and method of vermicomposting – field Application.

Teaching Pedagogy:

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

Unit	Topic	Hours	Marks	A	B	C
I	General account of microbes used as biofertilizers	11	17	01	01/02	01/0
II	Cyanobacteria	10	17	01/02	01/02	01/0
III	Mycorrhizal association	10	17	01/02	01/02	01/0
IV	Organic farming	11	17	01/02	01/02	01/0
		42hours		**6**	**7**	**4**

SEMESTER END EXAMINATION

Subject: **Semester:** **Course Title:**
Duration: 2 ½ hrs **Course Code:** **Max Marks: 60**
Question. No.

Instructions: 1) Answer two FULL QUESTIONS. 2) Use of Calculator permitted.

			Marks	CO	BTL
		PART-A			
1.	a)		2		
	b)		5		
	c)		8		
		OR			
2.	a)		2		
	b)		5		
	c)		8		
		PART-B			
3.	a)		2		
	b)		5		
	c)		8		
		OR			
4.	a)		2		
	b)		5		
	c)		8		
		PART- C			
5.	a)		2		
	b)		5		
	c)		8		
		OR			
6.	a)		2		
	b)		5		
	c)		8		
		PART- D			
7.	a)		2		
	b)		5		
	c)		8		
		OR			
8.	a)		2		
	b)		5		
	c)		8		

Reference Books:

1. Dubey, R.C. (2005). A Text book of Biotechnology S.Chand & Co, New Delhi.
2. John Jothi Prakash, E. (2004). Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
3. Kumaresan, V.(2005). Biotechnology, Saras Publications, New Delhi.
4. NIIR Board. (2012). The complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services.
5. Sathe, T.V. (2004) Vermiculture and Organic Farming. Daya publishers.
6. Subba Rao N.S. (2017). Biofertilizers in Agriculture and Forestry. Fourth Edition. Medtech.
7. Vayas,S.C, Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

DEPARTMENT OF ZOOLOGY

Semester-I (NEP)

Course Title	**Cytology, Genetics and Infectious Diseases**	**CIA Marks**	**40**
Course Code	119-DSC-01-T.1	SEE Marks	60
Scheme (L:T:P)	4:0:3	Credits	4
Teaching Hours	56	Examination Hours	3

Course objectives:This course will enable the students

1. To study the structure and function of the cell organelles in animal cell
2. To understand the complex processes in human cell such as cell cycle and cell division
3. To study the Mendel's laws of genetics, sex determination, genes and environment
4. To study the pattern of inheritance, human chromosomes and infectious diseases

Course Outcome: On completion of the course, students are able:

119-DSC-01-T.1- To define a cell and name the cell organelles.
119-DSC-01-T.2- To describe DNA and RNA composition in a cell
119-DSC-01-T.3- To discuss different chromosomal anomalies in human body
119-DSC-01-T.4- To state different laws of inheritance in geneticsand introduction to pathogenic organisms.

Mapping of CO with PO and PSO :

CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**CZ**	**BZ**	**ZBT/ ZMB**
119-DSC-01-T.1	1					3							3	3	3
119-DSC-01-T.2	1					3							3	3	3
119-DSC-01-T.3	1					3							3	3	3
119-DSC-01-T.4	1					3							3	3	3

Course Content :

Units	Contents	Credits
UnitI. Structure and Function of Cell Organelles in Animal cell.	Chapter 1.Plasma membrane: ❖ chemical structure—lipids and proteins **Chapter 2. Endomembrane system:** ❖ Protein targeting and sorting, transport, ❖ Endocytosis and exocytosis. **Chapter 3 Cytoskeleton:** ❖ Microtubules, microfilaments, intermediate filaments. ❖ Mitochondria: Structure, oxidative phosphorylation; electron transport system, Peroxisome and ❖ Ribosome: structure and function	14
UnitII Nucleus,ChromatinStructure, Cell cycle, CellDivisionand Cancer cell	**Chapter1:** Structureandfunctionofnucleusineukaryotes ❖ Chemicalstructureandbasecomposition of DNA and RNA. **Chapter2** ❖ NAsupercoiling, chromatinorganization, structure of chromosomes, ❖ TypesofDNAand RNA, ❖ Cell division: mitosis andmeiosis. **Chapter 3** ❖ Introduction to Cell cycle and its regulation, apoptosis, ❖ Properties of cancerous cells ❖ l-cell interaction: cell adhesion molecules, cellular junctions	14
Unit III. Mendelism, Sex Determination, Extensions of Mendelism, Genes and Environment	**Chapter1.Basicprinciplesofheredity:** ❖ Mendel'slaws-monohy bridcross and dihybridcross, Complete and Incomplete Dominance, ❖ Penetrance and expressivity, ❖ Genetic Sex-Determining Systems, Environmental Sex Determination, Sex Determinationan dmechanismin	

Units	Contents	Credits
Unit IV Structure and Function of Human Chromosomes, Patterns of Inheritance and Infectious diseases.	**Chapter 1.Plasma membrane:** ❖ Autosomal dominance, autosomal recessive. ❖ X-linked recessive, X-linked dominant.	14
	Chapter 2 Chromosomal anomalies: ❖ Structural and numerical aberrations with examples. ❖ Human karyotyping **Chapter 3 Introduction to pathogenic organisms:** Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of common parasites: *Virus (Hepatitis) Bacteria (Tuberculosis) Fungi (Candidiasis), Protozoa (Plasmodium falciparum) and Worms (Giardia and Wuchereria)*	

Teaching Pedagogy :

Chalk and talk, Written Assignment/ Presentation/ Project / TermPapers/ Seminar etc.

Blue print:

Marks / Units	2 marks	5 marks	08marks	Total questions	Total marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of questions	08	08	08	24	120
Total marks	**16**	**40**	**64**		

Reference Book :

1. Lodish et al: Molecular Cell Biology: Freeman &Co,USA (2004).
2. Alberts et al: Molecular Biology of the Cell:Garland(2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson(2004).
7. ThomasJ.Kindt,RichardA.Goldsby, BarbaraA.Osborne,JanisKuby-Kuby Immunology. W HFreeman(2007).
8. Delves PeterJ.,MartinSeamusJ.,BurtonDennisR.,RoittIvanM.Roitt'sEssentialImmunology, 13thEdition. Wiley Blackwell(2017).
9. Principles of Genetics by B. D.Singh
10. Cell-Biology by C. B. Pawar, KalyaniPublications

B. Sc I SEMESTER

MODEL QUESTION PAPER (THEORY)

Time: 2Hrs 30 minutes **Max Marks: 60**

Instructions: 1. Answer any four full questions.
2. Draw neat and labeled diagram wherever necessary.

			Marks	CO	BTL
Q.No.		**Unit-I**			
1.	a		2		
	b		5		
	c		8		
		or			
2.	a		2		
	b		5		
	c		8		
Q.No.		**Unit-II**			
3	a		2		
	b		5		
	c		8		
		or			
4	a		2		
	b		5		
	c		8		
Q.No		**Unit-III**			
5	a		2		
	b		5		
	c		8		
		or			
6	a		2		
	b		5		
	c		8		
Q.No.		**Unit-IV**			
7	a		2		
	b		5		
	c		8		
		or			
8	a		2		
	b		5		
	c		8		

Semester-I Practical (NEP)

Course Title	Cytology, Genetics and Infectious Diseases	CIA Marks	15
Course Code	119-DSC-01-P	SEE Marks	35
Scheme (L:T:P)	0:0:3	Credits	2
Teaching Hours	52	Examination Hours	3

Course objectives : This course will enable the students

1. To understand simple and compound microscopes
2. To study different types of cells
3. To study cell divisions such as Mitosis and Meiosis and their stages
4. To study the human parasites and their medical importance

Course Outcome : On completion of the course, students are able:

119-DSC-01-P.1- To analyze human karyotype.
119-DSC-01-P.2- To identify mutant drosophila forms.
119-DSC-01-P.3- To prepare onion root tip squash to study mitosis.
119-DSC-01-P.4- To recognize human parasites.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CZ	BZ	ZBT/ ZMB
119-DSC-01-P.1		2				3							3	3	3
119-DSC-01-P.2	1					3							3	3	3
119-DSC-01-P.3	1					3							3	3	3
119-DSC-01-P.4	1					3							3	3	3

Course Content :

List of labs to be conducted **52 hours.**

1. Understanding of simple and compoundmicroscopes.
2. Tostudy different cell typessuchasbuccalepithelialcells, neurons, striated muscle cellsusing Methylene Blue/anysuitablestain (virtual/ slaughteredtissue).
3. To study the different stages of Mitosis in root tip of Alliumcepa.
4. To study the different stages of Meiosis in grasshopper testis(virtual).
5. Tocheckthepermeabilityofcellsusingsaltsolutionof differentconcentrations.
6. Studyofparasitesinhumans(e.g.Protozoans,Helminthesincompliancewith examples beingstudied in theory) permanentmicro slides.
7. Tolearntheproceduresofpreparationoftemporary andpermanentstainedslides, with available mounting material.
8. StudyofmutantphenotypesofDrosophilasp. (fromCulturesor
9. Photographs).
10. Preparationofpolytenechromosomes(ChironomuslarvaorDrosophilalarva).
11. Preparationofhumankaryotypeandstudythechromosomalstructuraland numerical aberrations from the pictures provided.(Virtual/optional).
12. To prepare family pedigrees.

Teaching Pedagogy :

Chalk and talk, Power point Presentation etc.

Blue print :

Marks / Units	Marks
I	07
II	05
III	09
IV	04
V	05
Total No. of questions	**05**
Total marks	**30**

Reference Book :

1. Lodish et al: Molecular Cell Biology: Freeman &Co,USA(2004).
2. Alberts et al: Molecular Biology of the Cell:Garland(2002).
3. Cooper: Cell: A Molecular Approach: ASMPress(2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics.Freeman(2004).
5. Lewin B. Genes VIII. Pearson(2004).

Scheme of Practical Examination

Q.no1	Analysis of Karyotype of given sheet	07
Q.no2	Mitotic Squash preparation	05
Q.no3	Identification	09
Q.no4	Viva	04
Q.no5	Journal	05
	Total	30

Semester-I OEC (NEP)

Course Title	Economic Zoology	CIA Marks	40
Course Code	119-OEC-01-T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	3

Course objectives : This course will enable the students

1. To know about the history and present status of Sericulture, Apiculture and Aquaculture
2. To study the live stock management along with dairy, poultry and vermiculture
3. To study about the fish culture, prawn culture and lac culture

Course Outcome : On completion of the course, students are able:

119-OEC-01-T.1 - To name different species of honey bees silkworms, fishes, breeds of cattle
119-OEC-01-T.2 - To describe the social organization in honey bees and the products of apiculture
119-OEC-01-T.3- To discuss the dairy management and by products of dairy
119-OEC-01-T.4- To list the economic importance of the earthworms, honey bees, silkworms, poultry

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CZ	BZ	ZBT/ ZMB
119-OEC-01-T.1	1					3							3	3	3
119-OEC-01-T.2	2					3							3	3	3
119-OEC-01-T.3	2					3							3	3	3
119-OEC-01-T.4	2					3							3	3	3

Course Content :

Units	Contents	Credits
Unit I. Sericulture and Apiculture	**Chapter 1:** ❖ History and present status of sericulture in India, Mulberry and non-mulberry species in Karnataka and India, ❖ Mulberry cultivation, Morphology and life cycle of Bombyxmori, ❖ Silkworm rearing techniques: Processing of cocoon, reeling,Silkwormdiseases and pest control **Chapter 2.** ❖ Introduction and present status of apiculture, ❖ Species of honey bees in India, ❖ life cycle of Apisindica, Colonyorganization, division	14

Unit II Live Stock Management: Dairy, And Poultry.	of labouran dcommunication, ❖ Beekeeping as an agro based industry; methods and equipments: indigenous methods,extraction ❖ appliances, extraction of honey from the comb and processing, ❖ Bee Pasturage, honey and bees wax and their uses, Pests Diseases of bees and their management **Chapter1.** ❖ ntroduction to dairy animals and techniques of dairy ❖ Imanagement, ❖ Types, loose housing system and conventional barn system; advantages and limitations of dairyfarming. ❖ Establishment of dairy farm and choosing suitable dairy animals-cattle,Cattle feeds. ❖ Nutritive value of milk, milk products Cattle diseases **Chapter2 :** ❖ Types of poultry breeds and their rearing methods, ❖ Feed formulations for layers and broilers , ❖ Nutritive valueof egg and meat, 1. Disease of poultry and control measures.	14
Unit - III Aquaculture	**Chapter 1:** ❖ Aquaculture in India: An overview and present status and scope of aquaculture. Fishing crafts and gears. Common fishes used for culture ❖ Types of aquaculture: Pond culture: Construction, maintenance and management of culture pond; carp culture, shrimp culture, shellfish culture, composite fish culture and ❖ Pearl culture. Modern techniques of fish seed production **Chapter 2.** ❖ Ornamental fish culture: Fresh water ornamental fishes- biology, ❖ Breeding techniques, Construction and maintenance of aquarium. ❖ Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants,	

Unit IV Vermi culture and Lac Culture	ornamental objects, cleaning the aquarium, maintenance of water quality. ❖ Control of snail and algal growth. **Chapter 3.** ❖ Prawn Culture:Culture of fresh and marine water prawns ❖ Preparation of Prawn culture farm. ❖ Preservation and processing of prawn, export of prawn **Chapter 1:** Scope of vermiculture. ❖ Types of earthworms. Habit categories - epigeic, ❖ endogeic and anecic; indigenous and exotic species. ❖ Methodology of vermicomposting: containers for culturing, raw materials, required, preparation of bed, environmental pre- requisites, feeding, harvesting and storage of vermicompost. ❖ Advantages of vermicomposting.Diseases and pests of earthworms. **Chapter 2:** ❖ History of lac culture, lac production in India ❖ Life cycle, host plants and strains of lac insect. ❖ Lac cultivation: Local practice, improved practice, propagation of lac insect, inoculation period, harvesting of lac. ❖ Lac composition, processing, products, uses and their pests.	14

Teaching Pedagogy :

Chalk and talk, PPT, Group discussion, Seminar, Field visitetc.

Blue print:

Marks / Units	2 marks	5 marks	08marks	Total questions	Total marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of questions	08	08	08	24	120
Total marks	**16**	**40**	**64**		

Reference Book :

1. Eikichi,H.(1999).SilkwormBreeding(TranslatedfromJapanese).Oxford&IBHPublishingCo. Pvt. Ltd., NewDelhi.
2. Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and SilkReeling.
3. Oxford &IBH Publishing Co. Pvt. Ltd., NewDelhi.
4. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., (2000). MulberrySilk
5. Reeling Technology Oxford &IBH Publishing Co. Pvt. Ltd., NewDelhi.
6. Roger,M(1990).TheABCandXyzofBeeCulture:AnEncyclopediaofBeekeeping,Kindle Edition.
7. ShuklaandUpadhyaya(2002).EconomicZoology,RastogiPublishers
8. YadavManju(2003).EconomicZoology,DiscoveryPublishingHouse.
9. JabdePradip V (2005). Textbook of applied Zoology, Discovery Publishing House, NewDelhi.
10. Cherian &Ramachandran Bee keeping in-South Indian Govt. Press, Madras.
11. Sathe, T.V. Vermiculture and Organicfarming.
12. Bard. J (1986). Handbook of TropicalAquaculture.
13. Santhanam, R. A. Manual ofAquaculture.
14. Zuka. R.1 and Hamiyn(1971). Aquarium fishes andplants
15. Jabde,P.V.(2005) TextBookofAppliedZoology:Vermiculture,Apiculture,Sericulture,Lac culture.
16. Animal Disease- BairagiK. N. AnmolPublications Pvt.Ltd2014
17. Economics Of Aquaculture - Singh(R.K.P) - Danika Publishing Company2003
18. Applied and Economic Zoology (SWAYAM) webhttps://swayam.gov.in/nd2_cec20_ge23/preview
19. FAO manual 1,2 and 3

B. Sc I SEMESTER

MODEL QUESTION PAPER (THEORY)

Time: 2Hrs 30 minutes **Max Marks: 60**

Instructions: 1. Answer any four full questions.
2. Draw neat and labeled diagram wherever necessary.

			Marks	CO	BTL
Q.No.		**Unit-I**			
1.	a		2		
	b		5		
	c		8		
		or			
2.	a		2		
	b		5		
	c		8		
Q.No.		**Unit-II**			
3	a		2		
	b		5		
	c		8		
		or			
4	a		2		
	b		5		
	c		8		
Q.No		**Unit-III**			
5	a		2		
	b		5		
	c		8		
		or			
6	a		2		
	b		5		
	c		8		
Q.No.		**Unit-IV**			
7	a		2		
	b		5		
	c		8		
		or			
8	a		2		
	b		5		
	c		8		

Semester-I SEC (NEP)

Course Title	Vermiculture	CIA Marks	20
Course Code	119-SBC-01-P	SEE Marks	30
Scheme (L:T:P)	0:0:3	Credits	2
Teaching Hours	30	Examination Hours	3

Course objectives:This course will enable the students

1. To study the biology and life cycle of earthworms.
2. To study the types of earthworms.
3. To understand the establishment of vermiculture unit.
4. To study the economic importance of the products of vermiculture.

Course Outcome: On completion of the course, students are able:

119-SBC-01-P.1 - To prepare vermiculture pits.
119-SBC-01-P.2 - To identify earthworm species.
119-SBC-01-P.3 - To practice the preparation of worm feed.
119-SBC-01-P.4 - Todemonstrate the vermiculture techniques.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CZ	BZ	ZBT/ ZMB
119-SBC-01-P.1	3			2		1				3			3	3	3
119-SBC-01-P.2	1			2		1				3			3	3	3
119-SBC-01-P.3	3			2		1				3			3	3	3
119-SBC-01-P.4	3			2		1				3			3	3	3

Course Content :

	Contents	Hours
Practicals		**30**

- ❖ Biology and life cycle of earthworm,
- ❖ Types of earthworms.
- ❖ Establishment of vermiculture unit,
- ❖ Preparation of bed, inoculation , composting process, harvesting of vermicompostandworms,
- ❖ Economic importance of vermicompost, vermiwash, vermi-protein.
- ❖ Natural enemies of earthworms and their controlmeasures.

Visit to vermiculture farm to acquaint latest field techniques

1. Collection of native earthworm species to study habit and habitat.
2. Keys to identify different species of earthworms
3. Study of vermicomposting equipment and devices.
4. Preparation of vermibeds and their maintenance
5. Study of different vermicomposting methods.
5. Harvesting of compost and separation of worms,
7. Establishment of vermiwash unit,

8. Packaging, transport and storage of varmicompost.
9. Worm meal preparation, preservation and packing
10. Physico-chemical and estimation of vermicompost,vermiwash and vermi protein

Teaching Pedagogy :

Chalk and talk, Power point Presentation etc.

Blue print :

Marks / Units	Marks
I	07
II	08
III	10
IV	05
Total No. of questions	**04**
Total marks	**30**

Reference Book :

1. BhattJ V & R. Khambata (1959)? Role of Earthworm sin Agriculture? Indian Council of Agricultural Research, NewDelhi
2. Edwards, C.A. and R. Lofty (1977)? Biology of Earthworms? Chapman and Hall Ltd., London.
3. Like(1985)? Earthworms : Theirecology and Relationship with Soilsand Land Use? Academic Press, Sydney.
4. Dash, M. C., B. K. Senapati, P. C. Mishra (1980)? Vermsand Vermicomposting? Proceedings of the National Seminaron Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, JyotiVihar,Orissa.
5. Kevin, and E. Lee (1989)? Earthworm for Gardeners and Fisherman? (CSIRO, Australia, Division of Soils)
6. Satchel, J. E. (1983)? Earthworm Ecology? Chapman Hall, London. Wallwork, J. A. (1983)? Earthworm Biology? Edward Arnold (Publishers) Ltd. London.

Scheme of Practical Examination

Q.no1	Explain the given earthworm system	07
Q.no2	Preparation of vermin pit	08
Q.no3	Viva	10
Q.no4	Journal	05
	Total	**30**

Semester-II (NEP)

Course Title	Biochemistry and Physiology	CIA Marks	40
Course Code	119-DSC-02-T	SEE Marks	60
Scheme (L:T:P)	4:0:3	Credits	4
Teaching Hours	56	Examination Hours	3

Course objectives : This course will enable the students

1. To study the structure, function and regulation of enzymes
2. To study the carbohydrate, lipid and protein metabolism
3. To study different physiological processes such as digestion, respiration and excretion in humans
4. To understand complex systems in humans such as Nervous and muscular system

Course Outcome : On completion of the course, students are able:

119-DSC-02-T.1 - To define proteins, carbohydrates and lipids with examples
119-DSC-02-T.2 - To describe thermodynamics of enzyme catalyzedreactions
119-DSC-02-T.3 - To discuss the mechanism of energy production at cellular and molecular levels
119-DSC-02-T.4 - To name different physiological and bio chemical processes

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CZ	BZ	ZBT/ ZMB
119-DSC-02-T.1	2					3							3	3	3
119-DSC-02-T.2	2					3							3	3	3
119-DSC-02-T.3	2					3							3	3	3
119-DSC-02-T.4	2					3							3	3	3

Course Content :

Units	Contents	Hours
Unit 1. Metabolism of Carbohydrates, Lipids	❖ Metabolism, Proteins and Nucleotides. **Chapter 1:** ❖ Metabolism of Carbohydrates: glycolysis, citricacid cycle, gluconeogenesis, phosphate pentose pathway Glycogenolysis and Glycogenesis. **Chapter 2:** ❖ Lipids- Biosynthesis of palmiticacid; Ketogenesis, ❖ ß-oxidation and omega-oxidation of saturated fatty acids with even and odd number of carbonatoms. **Chapter 3:** ❖ Catabolism of amino acids: Transamination, Deamination, ❖ Ureacycle, ❖ Nucleotides and vitamins,	14

Unit II. Structure, function, biochemicals, action of regulation	**Chapter 1:** ❖ Nomenclature and classification of enzymes; Cofactors; specificity of enzyme action ❖ Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). **Chapter 2:** Lipids (saturated and unsaturated Fatty acids, Tri-acylglycerols, Phospho lipids, Glycolipids and Steroids) Structure, Classification and General Properties of a-amino acids; Essential and non-essential amino acids, Levels of organization in proteins; Simple and conjugate proteins **Chapter 3:** ❖ Isozymes; Mechanism of enzyme action, ❖ Enzyme kinetics;Factorsaffecting rate of enzyme-catalyzed reactions; Regulation of enzyme action.	14
Unit 3 Digestion, Respiration, Circulation and Excretion in humans	**Chapter 1:** ❖ Structural organization and functions of gastrointestinal tract and associated glands. ❖ Mechanical and chemical digestion of food ❖ Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; **Chapter 2:** ❖ Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; ❖ Transport of oxygen and carbon dioxide in blood, Respiratory pigments, ❖ Dissociation curves and the factors influencing it; ❖ Control of respiration **Chapter 3:** ❖ Components of blood and their functions; hemopoiesis, ❖ Blood clotting: Blood clotting system, ❖ Blood groups: Rh-factor, ABO and MN. ❖ Structure of mammalian heart, ❖ Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, ❖ Blood pressure and its regulation, ❖ Structure of kidney and its functional unit; Mechanism of urineformation	14
Unit IV Nervous System, Endocrinology and Muscular System in	**Chapter 1:** ❖ Structure of neuron ❖ resting membrane potential(RMP) ❖ Origin of action potential and its propagation across the myelinatedandunmyelinated nerve fibers. ❖ Types ofsynapse.	

humans	**Chapter 2 :** ❖ Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and ❖ adrenal; hormones secreted by them. ❖ Classification of hormones ❖ Mechanism of Hormone action. **Chapter 3:** ❖ Histology of different types of muscle ❖ Ultra structure of skeletal muscle ❖ Molecular and chemical basis of muscle contraction ❖ Characteristics of muscle twitch; Motor unit	**14**

Teaching Pedagogy :

Chalk and talk,Written Assignment/ Presentation/ Project / Term Papers/ Seminaretc.

Blue print:

Marks / Units	2 marks	5 marks	08marks	Total questions	Total marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of questions	08	08	08	24	120
Total marks	**16**	**40**	**64**		

Reference Book :

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan(2000)
2. Zubay et al: Principles of Biochemistry: WCB(1995)
3. Voet&Voet: Biochemistry Vols l &2: Wiley(2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford UniversityPress
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company.(2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley &sons(2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume l &2, 11th edition, CBS Publishers (20 I6).

B. Sc II SEMESTER

MODEL QUESTION PAPER (THEORY)

Time: 2Hrs 30 minutes **Max Marks: 60**

Instructions: 1. Answer any four full questions.
2. Draw neat and labeled diagram wherever necessary.

			Marks	CO	BTL
Q.No.		**Unit-I**			
1.	a		2		
	b		5		
	c		8		
		or			
2.	a		2		
	b		5		
	c		8		
Q.No.		**Unit-II**			
3	a		2		
	b		5		
	c		8		
		or			
4	a		2		
	b		5		
	c		8		
Q.No		**Unit-III**			
5	a		2		
	b		5		
	c		8		
		or			
6	a		2		
	b		5		
	c		8		
Q.No.		**Unit-IV**			
7	a		2		
	b		5		
	c		8		
		or			
8	a		2		
	b		5		
	c		8		

Semester-II Practical (NEP)

Course Title	Biochemistry and Physiology	CIA Marks	15
Course Code	119-DSC-02-P	SEE Marks	35
Scheme (L:T:P)	0:0:3	Credits	2
Teaching Hours	52	Examination Hours	3

Course objectives : This course will enable the students

1. To prepare the models of nitrogenous bases, DNA and RNA
2. To perform qualitative analysis of carbohydrates, lipids and proteins
3. To learn separation of amino acids by paper chromatography
4. To study the estimation of haemoglobin in blood and counting of RBC and WBCs

Course Outcome : On completion of the course, students are able:

119-DSC-02-P.1 - To prepare nitrogenous base models.
119-DSC-02-P.2 - To test for various nutrients in samples.
119-DSC-02-P.3 - To estimate hemoglobin percentage in humans.
119-DSC-02-P.4 - To practice counting of RBC's and WBC's.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CZ	BZ	ZBT/ ZMB
119-DSC-02-P.1	2					3							3	3	3
119-DSC-02-P.2	2					3							3	3	3
119-DSC-02-P.3	2					3							3	3	3
119-DSC-02-P.4	2					3							3	3	3

Course Content :

List of labs to be conducted **Hours 52**

1. Preparation of models of nitrogenous bases- nucleosides andnucleotides.
2. Preparation of models of amino acids anddipeptides.
3. Preparation of models of DNA andRNA.
4. Qualitative analysis of Carbohydrates, Proteins andLipids.
5. QualitativeanalysisofNitrogenouswastes–Ammonia,UreaandUricacid.
6. Separation of amino acids or proteins by paperchromatography.
7. Determinationoftheactivityofenzyme (Urease) Effectof[S]anddeterminationof Km andVmax.
8. Determinationoftheactivityofenzyme(Urease)-Effectoftemperatureandtime.
9. Action of salivary amylase underoptimumconditions.
10. QuantitativeestimationofOxygenconsumptionbyfreshwaterCrab.
11. Quantitativeestimationofsaltgainandsaltlossbyfreshwater.
12. EstimationofHemoglobininhumanbloodusingSahli'shaemoglobinometer.
13. Counting of RBC in blood usingHemocytometer.
14. CountingofWBCinbloodusingHemocytometer.
15. Differentialstainingofhumanbloodcorpuscles using Leishmanstain
16. Recording of blood glucose level by using glucometer

Teaching Pedagogy :

Chalk and talk, Power point Presentation etc.

Blue print :

Marks / Units	Marks
I	05
II	08
III	08
IV	04
v	05
Total No. of questions	**05**
Total marks	**30**

Reference Book :

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan(2000)
2. Zubay et al: Principles of Biochemistry: WCB(1995)
3. Voet&Voet: Biochemistry Vols l &2: Wiley(2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford UniversityPress
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company.(2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons(2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education(2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates,(2004).
9. Chatterjee CC Human Physiology Volume l &2, 11th edition, CBS Publishers (20 I 6).

Scheme of Practical Examination

Q.no1	Qualitative analysis of carbohydrates/lipids /proteins	05
Q.no2	Estimation of hemoglobin in blood / counting of RBC	08
Q.no3	Identification	08
Q.no4	Viva	04
Q.no5	Journal	05
	Total	**30**

Semester-IIOEC (NEP)

Course Title	Parasitology	CIA Marks	40
Course Code	119-OEC-02-T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	3

Course objectives : This course will enable the students

1. To study the origin and evolution of parasites
2. To study the basic concepts of Parasitism, symbiosis, phoresis, commensalisms and mutualism, Host-parasite interactions and adaptations.
3. To study about the parasitic nematodes, arthropods and vertebrates
4. To understand molecular diagnosis and clinical parasitology

Course Outcome : On completion of the course, students are able:

119-OEC-02-T.1 - To name different parasites and their infective stages
119-OEC-02-T.2 - To describe the life cycle of parasites
119-OEC-02-T.3 - To discuss the diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.
119-OEC-02-T.4 - To describe ecological model to know population dynamics of parasite, establishment of parasite population in host body

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CZ	BZ	ZBT/ ZMB
119-OEC-02-T.1	1			3		3							3	3	3
119-OEC-02-T.2	1			3		3							3	3	3
119-OEC-02-T.3	1			3		3							3	3	3
119-OEC-02-T.4				3		3							3	3	3

Course Content :

Unit	Contents	Credits (42)
Unit – 1 General Concepts Parasitic Platyhelminthes and Parasitic Protists	**Chapter 1.** ❖ Introduction, Parasites, parasitoids, host zoonosis ❖ Origin and evolution of parasites, ❖ Basic concept of Parasitism, symbiosis, phoresis, commensalisms and mutualism, Host-parasite interactions and adaptations. ❖ Life cycle of human parasites,Occurance, mode of infection and prophylaxis **Chapter 2.** ❖ Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of Fasciolopsis buski Schistosoma, haematobium, Taenia Solium,Hymenolepisnana	14 14

	Chapter3. ❖ Study Of Morphology,lifecycle,pathogenicity,prophylaxis andcontrolmeasures of, Entamoeba Histolytica,Giardia Intestinalis,Trypanosoma Gambiense,Plasmodiumvivax	14
Unit – 2	**Parasitic Nematodes, Arthropods and Vertebrates** **Chapter 1.** ❖ Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of Ascaris Lumbricoides, Ancylostoma Duodenale, Wuchereria Bancrofti, Trichinellaspiralis, ❖ Nematode plant interaction ; Gall formation	14
	Chapter 2. ❖ Biology, importance and control of Ticks (Soft tick Ornithodoros, ❖ Hard tick (Ixodes),Mites(Sarcoptes),Lice (Pediculus). ❖ Flea (Xenopsylla),Bug (Cimex),Parasitoid (Beetles) 14	
	Chapter 3. ❖ CookicutterShark, Hood Mocking bird and Vampire bat and their parasitic behavior and effect on host	14
Unit – 3 Molecular diagnosis and clinical parasitology	**Chapter 1.** ❖ General concept of molecular diagnosis for parasitic infection, ❖ Advantages and disadvantages of molecular diagnosis	14
	Chapter 2. ❖ Fundamental techniques used in molecular diagnosis of endoparasites	
	Chapter 3. ❖ Immunoassay or serological techniques for laboratory diagnosis of endoparasiteson the basis of marker molecules like ❖ G.intestinalis, B. coli, E. histolytica, L. donovani, Malarial parasiteusingELISA,RIA,Counter CurrentImmunoelectrophoresis(CCI),Complement Fixation Test (CFT) PCR, DNA, RNAprobe	14

Teaching Pedagogy :

Chalk and Talk, PPT, Group discussion, Seminar, Interaction, virtual lab, Lab visit

Blue print:

Marks / Units	2 marks	5 marks	08marks	Total questions	Total marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of questions	08	08	08		120
Total marks	**16**	**40**	**64**	24	

Reference Book :

1. Arora, D. Rand Arora, B. (2001) Medical Parasitology. IIEdition. CBS Publications and Distributors.
2. E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition,Lea&Febiger.
3. Ahmed, N., Dawson, M., Smith, C. and Wood, Ed.(2007) Biology of Disease. Taylor and Francis Group.
4. Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colourAtlas), IIEdition, AllIndia Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
5. Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W. C. Brown Publishers.
6. K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P)Ltd.
7. Gunn, A. and Pitt, S. J. (2012). Parasitology: an Integrated Approach. Wiley Black well.
8. Noble, E. R. and G. A. Noble (1982) Parasitology: Thebiology of animalparasites. VthEdition, Lea & Febiger.
9. Paniker, C. K. J., Ghosh, S. [Ed} (2013). Paniker's Text Book of Medical Parasitology. Jaypee, New Delhi.
10. Parija, S. C. Text book of medical parasitology, protozoology & helminthology (Text And color Atlas), II Edition, All India Publisher Distributor,Medical Books Publishers, Chennai,Delhi.

B. Sc II SEMESTER

MODEL QUESTION PAPER (THEORY)

Time: 2Hrs 30 minutes **Max Marks: 60**

Instructions: 1. Answer any four full questions.
2. Draw neat and labeled diagram wherever necessary.

			Marks	CO	BTL
Q.No.		**Unit-I**			
1.	a		2		
	b		5		
	c		8		
		or			
2.	a		2		
	b		5		
	c		8		
Q.No.		**Unit-II**			
3	a		2		
	b		5		
	c		8		
		or			
4	a		2		
	b		5		
	c		8		
Q.No		**Unit-III**			
5	a		2		
	b		5		
	c		8		
		or			
6	a		2		
	b		5		
	c		8		
Q.No.		**Unit-IV**			
7	a		2		
	b		5		
	c		8		
		or			
8	a		2		
	b		5		
	c		8		

DEPARTMENT OF STATISTICS

NEP-2020: B Sc I, II, sem

120DSC01T : DESCRIPTIVE STATISTICS

			Theory	Practical
Total Credits	6	Total marks	100	50
Theory Credits/Hours	4/4	I A marks	40	20
Practical credits/ Hours	2/4	Sem End Exam marks	60	30
Teaching Theory/ Practical	56/52	Passing %	40%	40%

Course Objectives :

1. To understand the measurement scales, segregation of data and its presentation.
2. Tounderstandandenabletheuseofdescriptivestatistical tools and techniquesinanalyzingandinterpreting data.

Course Outcomes (CO) :

- 120DSC01T.1.To identify various types of data, their organization and evaluation of summary Measures.
- 120DSC01T.2. Different types of correlation, regression analysis, regression diagnostics, partial and multiple correlations.
- 120DSC01T.3. Basic terminologies and concept of types of data reflecting independence and association between two or more attributes.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	1
120DSC01T.1	3	--	--	--	--	2	2	2	3	2	3
120DSC01T.2	2	3	3	--	2	1	2	3	2	3	3
120DSC01T.3	2	2	1	--	--	1	2	2	1	1	1

Contents (Theory) :

Unit1:Introduction to Statistics **13 Hours**

Statistics : Definition and scope. Concepts of population and sample (SRS, Stratified, Systematic and Cluster sampling methods (Definitions only).Scales of measurement: nominal, ordinal, interval and ratio. Data: qualitative & quantitative – cross-sectional and time-series. Data Collection: Primary & Secondary data, sample & census Survey. Presentation of data: tabular and graphical. Discrete & Continuous Variables. Frequency distributions, cumulative frequency distributions and their graphical representations. Stem and leaf displays.

Unit2 : Univariate Data Analysis **18 Hours**

Measures of Central Tendency : Arithmetic Mean (weighted mean, trimmed mean), Median, Mode, Geometric and Harmonic means, properties, merits and limitations, relation between these measures. Partition Values.

Measures of Dispersion : Range, Quartile deviation, Mean deviation, Standard deviation and their relative measures. Gini's Coefficient, Lorenz Curve. Moments, Skewness and Kurtosis. Quantiles and measures based on them. Box Plot. Outliers. Normal datasets.

Unit3 : BivariateDataAnalysis **12Hours**

Bivariate Data analysis, Meaning & Definition of Correlation. Methods: Scatter plot, Correlation, Karl Pearson's correlation coefficient, Spearman's Rank correlation and Kendall's measures. Concept of errors, Principle of least squares, fitting of straight-line, polynomial and exponential curves. Simple linear regression and its properties. Fitting of linear regression line and coefficient of determination.

Unit4 : Multivariate Data Analysis **13 Hours**

Analysis of Categorical Data : Contingency table, independence and association of attributes, measures of association - odds ratio, Pearson's and Yule's measure, Multivariate Frequencies, Multivariate Data Visualization, mean vector and dispersion matrix, multiple and partial correlation coefficients, Multiple linear regression &Residual analysis.

References :

1. Agresti, A. (2010) : Analysis of Ordinal Categorical Data, 2nd Edition, Wiley.
2. Anderson T. W. and Jeremy D. Finn (1996). The New Statistical Analysis of Data, Springer
3. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
4. Gupta, S. C. (2018), Fundamental of Statistics, Himalaya Publishing House, 7th Edition.
5. Gupta S. C. and V. K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition. Hogg, R. V. Mc Kean J. W. and Craig, A. T. (2012), Introductionto Mathematical Statistics, Pearson 7th Edition.
6. Joao Mendes Moreira, Andre CPLFde Carvalho, Tomas Horvath (2018), General Introductionto Data Analytics, Wiley.
7. Johnson, R. A. and Bhattacharyya, G. K. (2006), Statistics : Principles and methods. 5th Edition, John Wiley & Sons, New York.
8. Medhi, J. (2005), Statistical Methods, New AgeInternational.
9. Ross, S. M. (2014), Introductionto Probability and Statistics for Engineers and Scientists, 5th Edition, AcademicPress.
10. Tukey, J. W. (1977), Exploratory Data Analysis, Addison-Wesley Publishing Co.

Blueprint for B.Sc I Semester

Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Introduction to Statistics	13	2	2	2	28
2.	Univariate Data Analysis	18	2	2	2	28
3.	Bivariate Data Analysis	12	2	2	2	28
4.	Multivariate Data Analysis	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		**8**	**20**	**32**	**60**

Practical's based on
120DSC01P : DESCRIPTIVESTATISTICS

Course Objectives :

1. Todeveloptheabilityinorganizing, classifying and presenting the datausingvarious forms of tables, diagrams, graphs, charts and plots especially used in the field of statistics.
2. Tounderstand and enabletheuse of statistical tools and techniquesavailabletodeal withd at afromvarious fields.

Course Out comes (CO) :

1. The skill of population and sample survey, data collection methods creates a strong foundation in students, which prepares them in conducting a research survey even in other curriculum aspects.
2. Students will gain knowledge on practical approach in statistical methods like measures of central tendency, dispersion, skewness, correlation, regression.
3. Students will be able to acquire computational and visualization skills in Excel.

Pedagogy :

The course is taught using Excel software to carry out descriptive statistical analysis.

Contents(Practical's):

(Computing all the practical's manually and using Excel)

1. Presentation of data by frequency tables, diagrams and graphs, stemandleaf, partitionvalues.
2. Arithmetic Mean (AM), geometricmean, harmonicmean, weighted A M, trimmedmean, correcte mean.
3. Mode, median, partition values.
4. Absolute and relative measures of dispersion, Boxplots.
5. Problems on moments, skewness and kurtosis.
6. Fitting of curves by least squares method.
7. KarlPearson's correlation coefficient and Spearman's rank correlation.
8. Simple linear Regression of two variables.
9. Multivariate Descriptive statistics: Mean Vector, Variance - covariance matrix. Partialand Multiple correlation.
10. Problems on Association of attributes.

OPENELECTIVE COURSE (OEC)-I

120OEC01T : STATISTICAL METHODS

Total Credits	3	Total marks	100
Theory Credits/Hours	3	I A marks	40
Practical			
credits/ Hours	----	Sem End Exam marks	60

Course Objectives :

1. This is an open elective course for other than statistics students.
2. The students will learn the elements of descriptive statistics, probability, statistical methods tests of hypotheses, correlation and regression.

Course Outcomes :

120OEC01T.1. Presentation of data through diagrams and graphs.
120OEC01T.2. To apply different statistical measures to summarize the data.
120OEC01T.3. To demonstrate the concept of probability with examples.
120OEC01T.4. To apply suitable test procedures for given data set.

Mapping of CO with PO and PSO :

Course	PO										PSO
Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	1
120OEC01T.1	1	--	--	3	3	2	3	2	--	2	2
120OEC01T.2	2	3	2	--	2	--	2	2	1	2	3
120OEC01T.3	3	2	--	--	--	--	--	2	2	3	3
120OEC01T.4	3	3	3	2	2	--	2	3	3	3	3

Contents (Theory):

Unit1: Introduction **10 Hours**

Definition and scope of Statistics. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Data Collection: Primary & Secondary data, sample & census Survey. Presentation: tabular, diagrammatic and graphic representation. Concepts of population and sample. Sampling from finite population - Simple random sampling, Stratified and systematic random sampling procedures(definition sand methods only). Sampling and non-sampling errors.

Unit2 : Univariateand Bivariate Data Analysis **10 Hours**

Measures of Central Tendency :mathematical and positional. Measures of Dispersion: range, quartile deviation,standarddeviation,coefficientofvariation,moments,skewnessand kurtosis with examples.

Bivariate data, scatter diagram, Correlation, Karl Pearson's correlation coefficient, Rank correlation. Simple linea regression with examples.

Unit3 : Probability and Distributions **12 Hours**

Probability : Random experiment, trial, sample space, events-mutually exclusive and exhaustive events. Classical, statistical and axiomatic definitions of probability, addition and

multiplication theorems, Bayes Theorem (onlystatements). Discreteand continuousr and omvariables, probability massand density functions, distribution functions, expectation of a random variable. Standard univariate distributions: Binomial, Poisson and Normal distributions (Elementary properties and applications only).

Unit4 : Sampling Distributions and Testing of Hypothesis **10 Hours**

Distribution of sample mean from a normal population, Chi-square, t and F distributions (No derivations) and their applications. Statistical Hypothesis–null and alternative hypothesis, simple and composite hypothesis. TypeI and Type II errors, level of significance, critical region, P-value and its interpretation. Test for single mean, equality of two means (Small & Large), Chi-square test for attributes.

References :

1. Daniel, W. W.(2007 Biostatistics-AFoundation forAnalysisinthe Health Sciences, Wiley
2. T. W. Anderson and Jeremy D. Finn (1996). The New Statistical Analysis of Data, Springer.
3. Mukhyopadyaya P (1999). AppliedStatistics, New Central book Agency, Calcutta.
4. Ross, S. M. (2014) Introduction to Probability and Statistics For Engineers and Scientists.
5. Cochran, W G (1984) : Sampling Techniques, Wiley Eastern, New Delhi.

Blueprint for B.Sc I Semester

Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Introduction	13	2	2	2	28
2.	Univariate and Bivariate					
	Data Analysis	18	2	2	2	28
3.	Probability and Distributions	12	2	2	2	28
4.	Sampling Distributions and					
	Testing of Hypothesis	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		**8**	**20**	**32**	**60**

Skill Enhancement Course (SEC)-I

120SEC01P: Statistical Data Analysis Using Software Packages (Microsoft Excel/Minitab/Matlab)

Total Credits	**2**	**Total marks**	**50**
Theory Credits/Hours	1/1	I A marks	20
Practical credits/ Hours	1/2	Sem End Exam marks	30

Course Outcomes (CO):

Upon the completion of this course students should be able to:

120SEC01P.1. To understand the Excel and enter different data patterns.

120SEC01P.2. To apply a relevant graphs and charts for the given data using Excel.

120SEC01P.3. To analyze best statistical tool for basic statistical analysis.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	1
120SEC01P.1	2	--	--	--	3	--	2	1	--	3	3
120SEC01P.2	--	--	--	1	2	--	2	2	--	3	3
120SEC01P.3	2	3	2	--	--	--	--	2	1	3	2

Contents (Theory) :

Unit-I: Data Handling in Excel. **10hours**

Getting Started with Excel,The Excel worksheet,Data entry on the worksheet ,Some important editing features of excel, Calculation on the worksheet, Built in functions , Editing data using excel form, Printing the data and results

Unit-II: Graphs and Charts in Excel. **10hours**

Excel charts and Application areas, Construction of a column/Bar Chart, Construction of a Histogram, Construction of a PIE-Chart, Construction of a Line Chart, and Construction of a Scatter Chart.

Unit-III: Descriptive Statistics Using Excel. **10hours**

Data Analysis package in Excel. Frequency distribution and Histogram, Summary Statistics (Descriptive), Correlation & Regression.

References: Statistics made simple : Sharma

SECONDSEMESTER

120DSC02T : PROBABILITY AND DISTRIBUTIONS

			Theory	Practical
Total Credits	6	Total marks	100	50
Theory Credits/Hours	4/4	I A marks	40	20
Practical credits/ Hours	2/4	Sem End Exam marks	60	30
Teaching **Theory/ Practical**	**56/52**	**Passing %**	**40%**	**40%**

Course Objectives :

1. To introduce the concepts of probability, its rules and applications.
2. Toenablethestudentstounderstandthetypesofrandomvariables, mathematical expectations.
3. To understand probability models and their applications.
4. To introduce R-programming and its use in descriptive statistics and probability models. To enable students to use statistical techniques for analysis and interpretation of data.

Course Outcomes (CO) : Students will acquire

120DSC02T.1. To distinguish between random and non-random experiments,

120DSC02T.2. To conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem.

120DSC02T.3. To understand the concept of discrete and continuous random variables and their probability distributions including expectation and moments.

120DSC02T.4. Know the basics in R programming in terms of constructs, control statements, string functions.

120DSC02T.5. To perform various operations and various functions to analyze data using appropriate syntax.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	1
120DSC02T.1	2	--	--	--	--	--	--	2	2	2	2
120DSC02T.2	2	2	--	--	--	--	--	2	2	2	2
120DSC02T.3	3	3	3	--	--	2	2	3	2	3	3
120DSC02T.4	3	3	1	3	3	2	--	3	2	3	3
120DSC02T.5	3	3	1	3	3	2	--	3	2	3	3

Contents (Theory):

Unit1 : Probability **15 Hours**

Random experiment, events (Mutually exclusive, mutually exhaustive, equally likely) definition with illustration, algebra of events, Sample space. Definitions of Probability : Classical, statistical, subjectiveandaxiomaticapproaches – illustrationsandapplications, Probability Space, Addition theorem, Conditional probability, independence of events and multiplication rule, Totalprobabilityrule, Bayes theorem-applications.

Unit 2 : Random Variables and Mathematical Expectation-(One Dimension) **12Hours**

Definitions of discrete and continuous random variables, Distribution function, probability mass and density functions –properties and illustrations, Expectation of a random variable and rules of expectation and related results, Moments and moment generating function, c. g. f. & p. g. f–properties and uses.

Unit3 : StandardDistributions **15 Hours**

Bernoulli, Binomial, Poisson & Normal distributions– its applications. Mean, Variance, Moments and m. g. f., c. g. f., p. g. f. & recurrence relations for probabilities and central moments.

Unit4 : DataAnalysis Using R **14 Hours**

IntroductiontoR : Installation,commandlineenvironment,overviewofcapabilities, briefmentionof open source philosophy. R as a calculator: The four basic arithmetic operations. Use of parentheses nesting up to arbitrary level. The power operation. Evaluation of simple expressions. Quotient and remainder operations for integers. Standard functions, e.g., sin, cos, exp, log. The different types of numbers in R: Division by zero leading to Inf or -Inf. NaN. NA. Variables. Creating a vector using c(), seq() and colon operator. Mapping of functions over vectors. Functions to summarize a vector: sum, mean, sd, median etc. Extracting a sub set from the vector (by index ,by property). Rasagraphing calculator: Introduction to plotting. Plot(),lines(), abline().Graphics parameters(colour and line width). Barplot, Pie chart and Histogram. Box plot. Scatter plot and simple linear regression using lm(y~x). Problems on discrete and continuous probability distributions.

References :

1. Dudewitz.E.J.andMishra.S.N.(1998),ModernMathematicalStatistics.JohnWiley
2. GoonA.M., Gupta M.K., DasGupta .B.(1991), Fundamentalsof Statistics, Vol.I,WorldPress,Calcutta.
3. Gupta.S.CandV.K.Kapoor(2020),FundamentalsofMathematicalStatistics,SultanChandand Co, 12thEdition.
4. Hogg,R.V.,Tanis,E.A.andRaoJ.M. (2009),ProbabilityandStatisticalInference,
5. Mood,A.M.,Graybill,F.A.andBoes,D.C.(2007),IntroductiontotheTheoryofStatistics,
6. Ross, S. (2002), A First Course in Probability, Prentice Hall.
7. Sudha G.Purohit, Sharad D. Gore, Shailaja R Deshmukh, (2009), Statistics UsingR, Narosa Publishing House.
8. R for beginners by Emmanuel Paradis (freely available at https://cran.r-project.org/doc/contrib/Paradisrdebuts_en.pdf)

Practical based on
120DSC02P : PROBABILITYANDDISTRIBUTIONS

Course Objectives :

1. To introduce the students to the field of probability theory as a foundation for Statistics.
2. Tointroduce the students to the field of randomvariablesandtheirprobabilityapproach, instudyingreal life situations/practical problems.
3. Toimpartessentialknowledgeinprobabilitydistributionsandexposétothereal-lifeapplicationsof probability distributions.
4. To enable to write and execute R-code for basics of probability and statistics.

Course Outcomes (CO) :

120DSC02P.1. Students will gain knowledge regarding practical approach to discrete and continuous random variables (RVs), PMF, PDF, sketching of probability distribution and density functions, expectation and variance of RVs, Joint PMF/ PDF, marginal and conditional probabilities, correlation coefficient of random variables and their applications.

120DSC02P .2. The practical aspects learnt will developabilityinstudenttounderstanda nd solvereallife problems.

120DSC02P.3. The tools and techniques collectively learnt from I and II semester helps a student to enter into a field of data science, IT etc. to successfully build career.

120DSC02P .4. Students will be able to write and execute R-code for basics of probability and statistics

Contents(Practicals) :

1. Twoexerciseon Descriptivestatistics (Presentations, Summarizations, correlations, regression and Graphs using Excel / R)
2. Computingprobability : usingadditionandmultiplicationtheorems.
3. ConditionalprobabilityandBayes'theorem.
4. Problemsonpmf, expectation, variance, quantiles, skewness, kurtosis (DiscreteCase).
5. Problemsonpdf, expectation, variance, quantiles, skewness, kurtosis (Continuouscase).
6. Problems On Discrete Probability distributions (Binomial And Poisson)
7. Problems On Normal Probability Distribution
8. Fittingof distributions Binomial, Poisson, Normal distributions / using R.
9. Generationofrandomsamples. (Binomial, Poisson,) / using R.
10. Generationofrandomsamples. (Normal) / using R.

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Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Probability	13	2	2	2	28
2.	Random Variables and Mathematical Expectation-(One Dimension)	18	2	2	2	28
3.	StandardDistributions	12	2	2	2	28
4.	DataAnalysis Using R	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		**8**	**20**	**32**	**60**

OPEN ELECTIVE COURSE (OEC)-II

120OEC02T : BUSINESSSTATISTICS

Total Credits	3	Total marks	100
Theory Credits/Hours	3	I A marks	40
Practical credits/ Hours	----	Sem End Exam marks	60

Course Objectives :

1. Provide an introduction to basics of statistics within a financial context.
2. Toenablestudentstousestatisticaltechniquesforanalysisandinterpretationofbusinessdata.

Course Outcomes (CO) :

Upon the completion of this course students should be able to :

120OEC02T.1. Understand and present the data meaningfully and summarize the data using different statistical measures.

120OEC02T .2. To analyze the relationship between variables.

120OEC02T.3. To explain types of index numbers. Construction and uses of cost of living index numbers.

120OEC02T.4. Construct suitable statistical model to forecast the business problems.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	1
120DSC01T.1	3	--	--	--	--	2	2	2	3	2	3
120DSC01T.2	2	3	3	--	2	1	2	3	2	3	3
120DSC01T.3	2	2	1	--	--	1	2	2	1	1	1

Contents (Theory):

Unit1 : Introduction to Statistics **13 Hours**

Statistics : Definition and scope. Concepts of population and sample (SRS, Stratified, Systematic and Cluster sampling methods (Definitions only).Scales of measurement: nominal, ordinal, interval and ratio. Data: qualitative & quantitative – cross-sectional and time-series. Data Collection: Primary & Secondary data, sample & census Survey. Presentation of data: tabular and graphical. Discrete & Continuous Variables. Frequency distributions, cumulative frequency distributions and their graphical representations. Stem and leaf displays.

Unit2 : Univariate Data Analysis **18 Hours**

Measures of Central Tendency: Arithmetic Mean (weighted mean, trimmed mean), Median, Mode, Geometric and Harmonic means, properties, merits and limitations, relation between these measures. Partition Values.

Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation and their relative measures. Gini's Coefficient, Lorenz Curve. Moments, Skewness and Kurtosis. Quantiles and measures based on them. Box Plot. Outliers. Normal datasets.

Unit3:BivariateDataAnalysis **12Hours**

Bivariate Data analysis, Meaning & Definition of Correlation. Methods: Scatter plot, Correlation, Karl Pearson's correlation coefficient, Spearman's Rank correlation and Kendall's measures. Concept of errors, Principle of least squares, fitting of straight-line, polynomial and exponential curves. Simple linear regression and its properties. Fitting of linear regression line and coefficient of determination.

Unit4 : Multivariate Data Analysis **13 Hours**

Analysis of Categorical Data: Contingency table, independence and association of attributes, measures of association - odds ratio, Pearson's and Yule's measure, Multivariate Frequencies, Multivariate Data Visualization, mean vector and dispersion matrix, multiple and partial correlation coefficients, Multiple linear regression &Residual analysis.

References :

1. Agresti, A. (2010) : Analysis of Ordinal Categorical Data, 2nd Edition, Wiley.
2. Anderson T. W. and Jeremy D. Finn (1996). The New Statistical Analysis of Data, Springer
3. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
4. Gupta, S. C. (2018), Fundamental of Statistics, Himalaya Publishing House, 7th Edition.
5. Gupta S. C. and V. K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7th Edition.
6. Joao Mendes Moreira, Andre CPLF de Carvalho, Tomas Horvath (2018), General Introductionto Data Analytics, Wiley.
7. Johnson, R. A. and Bhattacharyya, G. K. (2006), Statistics: Principles Methods. 5th Edition, John Wiley & Sons, New York.
8. Medhi, J. (2005), Statistical Methods, New AgeInternational.
9. Ross, S. M. (2014), Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.
10. Tukey, J. W. (1977), Exploratory Data Analysis, Addison - Wesley Publishing Co.

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Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Introduction to Statistics	13	2	2	2	28
2.	Univariate Data Analysis	18	2	2	2	28
3.	Bivariate Data Analysis	12	2	2	2	28
4.	Multivariate Data Analysis	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		**8**	**20**	**32**	**60**

Practical's based on

120DSC01P : DESCRIPTIVESTATISTICS

Course Objectives :

1. Todevelop the abilityinorganizing, classifying and presenting the data using various forms of tables, diagrams, graphs, charts and plots especially used in the field of statistics.
2. Tounderstand and enable the use of statistical tools and techniques available to deal with data from various fields.

Course Out comes (CO) :

1. The skill of population and sample survey, data collection methods creates a strong foundation in students, which prepares them in conducting a research survey even in other curriculum aspects.
2. Students will gain knowledge on practical approach in statistical methods like measures of central tendency, dispersion, skewness, correlation, regression.
3. Students will be able to acquire computational and visualization skills in Excel.

Pedagogy :

The course is taught using Excel software to carry out descriptive statistical analysis.

Contents(Practical's) :

(Computing all the practical's manually and using Excel)

1. Presentationofdatabyfrequencytables,diagramsandgraphs,stemandleaf,partitionvalues.
2. Arithmetic Mean (AM), geometricmean, harmonicmean, weighted AM, trimmedmean, correcte mean.
3. Mode, median, partition values.
4. Absolute and relative measures of dispersion, Boxplots.
5. Problems on moments, skewness and kurtosis.
6. Fitting of curves by least squares method.
7. KarlPearson's correlation coefficient and Spearman's rank correlation.
8. Simple linear Regression of two variables.
9. Multivariate Descriptive statistics: Mean Vector, Variance - covariance matrix. Partialand Multiple correlation.
10. Problems on Association of attributes.

OPENELECTIVE COURSE (OEC)-I
120OEC01T : STATISTICAL METHODS

Total Credits	3	Total marks	100
Theory Credits/Hours Practical	3	I A marks	40
credits/ Hours	----	Sem End Exam marks	60

Course Objectives :

1. This is an open elective course for other than statistics students.
2. The students will learn the elements of descriptive statistics, probability, statistical methods such as tests of hypotheses, correlation and regression.

Course Outcomes :

120OEC01T.1. Presentation of data through diagrams and graphs.
120OEC01T.2. To apply different statistical measures to summarize the data.
120OEC01T.3. To demonstrate the concept of probability with examples.
120OEC01T.4. To apply suitable test procedures for given data set.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	1
120OEC01T.1	1	--	--	3	3	2	3	2	--	2	2
120OEC01T.2	2	3	2	--	2	--	2	2	1	2	3
120OEC01T.3	3	2	--	--	--	--	--	2	2	3	3
120OEC01T.4	3	3	3	2	2	--	2	3	3	3	3

Contents (Theory) :

Unit1 : Introduction **10 Hours**

Definition and scope of Statistics. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Data Collection: Primary & Secondary data, sample & census Survey. Presentation: tabular, diagrammatic and graphic representation. Concepts of population and sample. Sampling from finite population - Simple random sampling, Stratified and systematic random sampling procedures (definition sand methods only). Sampling and non-sampling errors.

Unit2:Univariateand Bivariate Data Analysis **10 Hours**

Measures of Central Tendency : mathematical and positional. Measures of Dispersion: range, quartile deviation, standarddeviation, coefficientofvariation, moments, skewness and kurtosis with examples.

Bivariate data, scatter diagram, Correlation, Karl Pearson's correlation coefficient, Rank correlation. Simple linea regression with examples.

Unit3 : Probability and Distributions **12 Hours**

Probability: Random experiment, trial, sample space, events-mutually exclusive and exhaustive events. Classical, statistical and axiomatic definitions of probability, addition and multiplication theorems, Bayes Theorem (onlystatements). Discrete and continuous random variables, probability mass and density functions, distribution functions, expectation of a random variable. Standard univariate distributions: Binomial, Poisson and Normal distributions (Elementary properties and applications only).

Unit4 : Sampling Distributions and Testing of Hypothesis **10 Hours**

Distribution of sample mean from a normal population, Chi-square, t and F distributions (No derivations) and their applications. Statistical Hypothesis–null and alternative hypothesis, simple and composite hypothesis. TypeI and Type II errors, level of significance, critical region, P-value and its interpretation. Test for single mean, equality of two means (Small & Large), Chi-square test for attributes.

References :

1. Daniel,W.W.(2007 Biostatistics-AFoundation forAnalysisintheHealthSciences,Wiley
2. T.W.AndersonandJeremyD.Finn(1996).The NewStatisticalAnalysisofData,Springer.
3. MukhyopadyayaP(1999).AppliedStatistics,NewCentralbookAgency, Calcutta.
4. Ross,S.M.(2014)IntroductiontoProbabilityandStatisticsForEngineersandScientists.
5. Cochran,W G(1984):SamplingTechniques, WileyEastern,NewDelhi.

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Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Introduction	13	2	2	2	28
2.	Univariate and Bivariate Data Analysis	18	2	2	2	28
3.	Probability and Distributions	12	2	2	2	28
4.	Sampling Distributions and Testing of Hypothesis	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		8	20	32	60

Skill Enhancement Course (SEC)-I

120SEC01P : Statistical Data Analysis Using Software Packages (Microsoft Excel / Minitab / Matlab)

Total Credits	2	Total marks	50
Theory Credits/Hours Practical	1/1	I A marks	20
credits/ Hours	1/2	Sem End Exam marks	30

Course Outcomes (CO) :

Upon the completion of this course students should be able to:

120SEC01P.1. To understand the Excel and enter different data patterns.
120SEC01P.2. To apply a relevant graphs and charts for the given data using Excel.
120SEC01P.3. To analyze best statistical tool for basic statistical analysis.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	1
120SEC01P.1	2	--	--	--	3	--	2	1	--	3	3
120SEC01P.2	--	--	--	1	2	--	2	2	--	3	3
120SEC01P.3	2	3	2	--	--	--	--	2	1	3	2

Contents (Theory):

Unit-I: Data Handling in Excel. **10hours**

Getting Started with Excel,The Excel worksheet,Data entry on the worksheet ,Some important editing features of excel, Calculation on the worksheet, Built in functions , Editing data using excel form, Printing the data and results

Unit-II: Graphs and Charts in Excel. **10hours**

Excel charts and Application areas, Construction of a column/Bar Chart, Construction of a Histogram, Construction of a PIE-Chart, Construction of a Line Chart, and Construction of a Scatter Chart.

Unit-III: Descriptive Statistics Using Excel. **10hours**

Data Analysis package in Excel. Frequency distribution and Histogram, Summary Statistics (Descriptive), Correlation & Regression.

References : Statistics made simple : Sharma

SECONDSEMESTER

120DSC02T: PROBABILITY AND DISTRIBUTIONS

			Theory	Practical
Total Credits	6	Total marks	100	50
Theory Credits/Hours Practical	4/4	I A marks	40	20
credits/ Hours Teaching	2/4	Sem End Exam marks	60	30
Theory/ Practical	56/52	Passing %	40%	40%

Course Objectives :

1. To introduce the concepts of probability, its rules and applications.
2. Toenablethestudentstounderstandthetypesofrandomvariables, mathematical expectations.
3. To understand probability models and their applications.
4. To introduce R-programming and its use in descriptive statistics and probability models. To enable students to use statistical techniques for analysis and interpretation of data.

Course Outcomes (CO): Students will acquire

120DSC02T.1. To distinguish between random and non-random experiments,

120DSC02T.2. To conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem.

120DSC02T.3. To understand the concept of discrete and continuous random variables and their probability distributions including expectation and moments.

120DSC02T.4. Know the basics in R programming in terms of constructs, control statements, string functions.

120DSC02T.5. To perform various operations and various functions to analyze data using appropriate syntax.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	1
120DSC02T.1	2	--	--	--	--	--	--	2	2	2	2
120DSC02T.2	2	2	--	--	--	--	--	2	2	2	2
120DSC02T.3	3	3	3	--	--	2	2	3	2	3	3
120DSC02T.4	3	3	1	3	3	2	--	3	2	3	3
120DSC02T.5	3	3	1	3	3	2	--	3	2	3	3

Contents (Theory) :

Unit1:Probability **15 Hours**

Random experiment, events (Mutually exclusive, mutually exhaustive, equally likely)definition with illustration, algebra of events, Sample space. Definitions of

Probability: Classical, statistical, subjective and axiomatic approaches–illustrationsand applications, Probability Space, Addition theorem, Conditional probability, independence of events and multiplication rule, Total Probability Rule, Bayes theorem-applications.

Unit 2 : Random Variables and Mathematical Expectation-(One Dimension) **12Hours**

Definitions of discrete and continuous random variables, Distribution function, probability mass and density functions –properties and illustrations, Expectation of a random variable and rules of expectation and related results, Moments and moment generating function, c. g. f. & p. g. f–properties and uses.

Unit3 : StandardDistributions **15 Hours**

Bernoulli, Binomial, Poisson & Normal distributions– its applications. Mean, Variance, Moments and m. g. f., c. g. f., p. g. f. & recurrence relations for probabilities and central moments.

Unit4 : DataAnalysis Using R **14 Hours**

Introductionto R : Installation, command line environment, overview of capabilities, briefmentionof open source philosophy. R as a calculator: The four basic arithmetic operations. Use of parentheses nesting up to arbitrary level. The power operation. Evaluation of simple expressions. Quotient and remainder operations for integers. Standard functions, e.g., sin, cos, exp, log. The different types of numbers in R: Division by zero leading to Inf or -Inf. NaN. NA. Variables. Creating a vector using c (), seq () and colon operator. Mapping of functions over vectors. **Functions to summarize a vector :** sum, mean, sd, median etc. Extracting a sub set from the vector (by index ,by property). Rasagraphing calculator: Introduction to plotting. Plot(),lines(), abline (). Graphics parameters(colour and line width). Barplot, Pie chart and Histogram. Box plot. Scatter plot and simple linear regression using lm(y~x). Problems on discrete and continuous probability distributions.

References :

1. Dudewitz. E. J. and Mishra. S. N. (1998), Modern Mathematical Statistics. John Wiley
2. Goon A. M., Gupta M.K., DasGupta .B.(1991), Fundamentalsof Statistics, Vol. I, World Press, Calcutta.
3. Gupta. S. Cand V. K. Kapoor (2020), Fundamentals of Mathematical Statistics, Sultan Chand and Co, 12th Edition.
4. Hogg, R. V., Tanis, E. A. and Rao J. M. (2009), Probability and Statistical Inference,
5. Mood, A. M., Graybill, F. A. and Boes, D. C. (2007), Introduction To the Theory of Statistics,
6. Ross, S. (2002), A First Course in Probability, Prentice Hall.
7. Sudha G. Purohit, Sharad D. Gore, Shailaja R Deshmukh, (2009), Statistics Using R, Narosa Publishing House.
8. R for beginners by Emmanuel Paradis (freely available at https://cran.r-project.org/doc/contrib/Paradisrdebuts_en.pdf)

Practical based on

120DSC02P : PROBABILITYANDDISTRIBUTIONS

Course Objectives :

1. To introduce the students to the field of probability theory as a foundation for Statistics.
2. Tointroducethe students to the fieldofrandomvariablesand their probability approach, instudyingreal life situations/practical problems.
3. Toimpartessential knowled probability distributions and exposé to the real-life applications of probability distributions.
4. To enable to write and execute R-code for basics of probability and statistics.

Course Outcomes (CO) :

120DSC02P.1. Students will gain knowledge regarding practical approach to discrete and continuous random variables (RVs), PMF, PDF, sketching of probability distribution and density functions, expectation and variance of RVs, Joint PMF/ PDF, marginal and conditional probabilities, correlation coefficient of random variables and their applications.

120DSC02P .2. Thepracticalaspectslearnt will developabilityinstudenttounderstand and solve real life problems.

120DSC02P.3. The tools and techniques collectively learnt from I and II semester helps a student to enter into a field of data science, IT etc. to successfully build career.

120DSC02P .4. Students will be able to write and execute R-code for basics of probability and statistics

Contents(Practicals) :

1. Twoexerciseon Descriptive Statistics (Presentations, Summarization, correlation, regression and Graphs using Excel / R)
2. Compute Probability : using addition and multiplication theorems.
3. ConditionalprobabilityandBayes'theorem.
4. Problemsonpmf, expectation, variance, quantiles, skewness, kurtosis (Discrete Case).
5. Problemsonpdf, expectation, variance, quantiles, skewness, kurtosis (Continuouscase).
6. Problems On Discrete Probability distributions (Binomial And Poisson)
7. Problemson Normalprobabilitydistributions
8. Fittingof distributionsBinomial, Poisson, Normal distributions / using R.
9. Generation Of Random Sample. (Binomial, Poisson,) / using R.
10. Generation of random samples. (Normal) / using R.

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Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Probability	13	2	2	2	28
2.	Random Variables and Mathematical Expectation - (One Dimension)	18	2	2	2	28
3.	Standard Distributions	12	2	2	2	28
4.	DataAnalysis Using R	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		**8**	**20**	**32**	**60**

OPEN ELECTIVE COURSE (OEC)-II

120OEC02T: BUSINESSSTATISTICS

Total Credits	3	Total marks	100
Theory Credits/Hours Practical	3	I A marks	40
credits/ Hours	----	Sem End Exam marks	60

Course Objectives :

1. Provide an introduction to basics of statistics within a financial context.
2. Toenablestudentstousestatisticaltechniquesforanalysisandinterpretationofbusinessdata.

Course Outcomes (CO) :

Upon the completion of this course students should be able to:

120OEC02T.1. Understand and present the data meaningfully and summarize the data using different statistical measures.

120OEC02T.2. To analyze the relationship between variables.

120OEC02T.3. To explain types of index numbers. Construction and uses of cost of living index numbers.

120OEC02T.4. Construct suitable statistical model to forecast the business problems.

Mapping of CO with PO and PSO :

Course Outcome	PO										PSO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	1
120OEC02T.1	3	3	--	--	--	1	2	2	--	3	2
120OEC02T.2	2	3	3	2	3	2	3	2	2	3	3
120OEC02T.3	3	1	1	2	--	1	2	1	--	2	2
120OEC02T.4	3	1	1	2	2	1	2	2	--	2	2

Contents (Theory) :

Unit1 : Statistical Data and Descriptive Statistics **12 Hours**

Natureand Classification of data : univariate, bivariateandmultivariatedata ; time-seriesandcross- sectional data. Measures of Central Tendency : mathematical averages including arithmetic mean geometric mean and harmonic mean, properties and applications. Positional Averages Median, partition values including: quartiles, deciles, and percentiles and Mode. Measures of Variation : absolute and relative. Range, quartile deviation mean deviation, standard deviation ,and its relative measures, Properties of standard deviation/variance. Skewness: Meaning, Measurement using Karl Pearson and Bowley 'smeasures; Kurtosis.

Unit2 : Simple Correlation and Regression Analysis **10 Hours**

Correlation Analysis : Meaning of Correlation, Scatter diagram, simple , linear Correlation and its interpretation ,Pearson's co-efficient of correlation; calculation and properties (Proof not required). Rank Correlation.

Regression Analysis : Regression equations and estimation through Principle of least squares,; Properties of regression coefficient; Relationship between Correlation and Regression Coefficients; Standard Error of Estimate and its use in interpreting the results.

Unit3:IndexNumbers **10 Hours**

Definition, Problems involved in the construction of index numbers, methods of constructing index numbers of prices and quantities, simple aggregate and price relatives method, weigh ted aggregate and weight e daverage of relatives method, important types of weighted index numbers : Laspeyre's, Paasche's, Bowley's, Marshall- Edgeworth, Fisher's, method of obtaining price and quantity index numbers, tests consistency of index numbers, time reversal test and factor reversal test for index numbers, Uses and limitations of index numbers. Consumer price index number : Problems involved in the construction of cost of living index number, advantages and disadvantages, Aggregative expenditure method and Family budget method for the construction of consumer price index numbers. Applications of Cost of Living Index numbers.

Unit4 : TimeSeries Analysis **10 Hours**

Introduction, definitionandcomponents of Timeseries, illustrations, Additive, Multiplicative and Mixed models, analysis of time series, methods of studying time series: Secular trend, method of moving averages, least squares method – linear, quadratic, fittings to the data.

References :

1. Levin, Richard, David S. Rubin, Sanjay Rastogi, and HMSiddiqui. Statistics for Management. 7th ed., Pearson Education.
2. David M. Levine, MarkL. Berenson, Timothy C. Krehbiel, P. K. Viswanathan, Business Statistics :A First Course, Pearson Education.
3. Siegel Andrew F. Practical Business Statistics. Mc Graw Hill Education.
4. Gupta, S. P.,and Archana Agarwal. Business Statistics, Sultan Chandand Sons, New Delhi.
5. Vohra N.D., Business Statistics, Mc Graw Hill Education.
6. Murray R Spiegel, Larry J. Stephens, Narinder Kumar. Statistics (Schaum's Outline Series), Mc-Graw Hill Education.
7. Gupta, S. C. Fundamentals of Statistics. Himalaya Publishing House.
8. Anderson, Sweeney, and Williams, Statistics for Students of Economics and Business,

BLUE PRINT

Unit No	Name of the Unit	Teaching hours	2 marks	5 marks	8 marks	Total marks
1.	Statistical Data and Descriptive Statistics	13	2	2	2	28
2.	Simple Correlation and Regression Analysis	18	2	2	2	28
3.	Index Numbers	12	2	2	2	28
4.	Time Series Analysis	13	2	2	2	28
	Total	**60**	**8**	**8**	**8**	**112**
	Questions to be Answered		**4**	**4**	**4**	**12**
	Marks		**8**	**20**	**32**	**60**

DEPARTMENT OF ELECTRONICS

Semester-I

Course Title	FUNDAMENTALS OF ELECTRONICS: ELE -1	CIA Marks	40
Course Code	121DSC01T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	2.5

Course objectives : This course (121DSC01T) will enable the students to

Upon completion of the course, 121DSC01T, the student will be able to understand various fundamental principles of network analysis, number systems and Boolean algebra and become familiar with the basic operation of electronic devices and circuits which are the building blocks of all electronic circuits, devices and gadgets

Course Outcome : After successful completion of the course, students are able to;

121DSC01T.1 - Study and analyze basic networks using network theoremsin a systematic manner.

121DSC01T.2 – Build simple electronic circuits used in various applications.Describe the behaviour of basic semiconductor devices

121DSC01T.3 – Reproduce the VI characteristics of diode/BJT devicesDescribe the frequency response of BJT amplifiers.

121DSC01T.4 – Understand and represent numbers in powers of base and converting one from the other, carry out simple arithmetic operations.

Mapping of CO with PO and PSO :

CO	PO										PSO (PE/ME)
	1	2	3	4	5	6	7	8	9	10	
121DSC01T.1	3	3				1					3
121DSC01T.2	3	3	2			1	2	3		1	3
121DSC01T.3	3	3		2		3					3
121DSC01T.4	3	3	2	3		1	1			1	3

Course Content

UNIT-1: NETWORK ANALYSIS **10 Hours**

Electronic Components : Electronic passive and active components, types and their properties, Concept of Voltage and Current Sources, electric energy and power. (Qualitative only)

Network Theorems : Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity Theorems. DC and AC analysis of RC and RL circuits, RLC series and parallel Resonant Circuits.

UNIT-2 :- DIODE and it's APPLICATIONS **20 Hours**

PN junction diode : Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode, Reverse saturation current, Zener and avalanche breakdown.

Rectifiers-Half wave and Full wave (center tap and bridge) rectifiers, expressions for output voltage, ripple factor and efficiency (mention only), Shunt capacitor filter. (Numerical examples wherever applicable

Voltage regulator : Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317), Clippers (shunt type) and clampers(Qualitative analysis only), Voltage Multipliers.

UNIT-3:- BJT and it's APPLICATIONS **20 Hours**

Bipolar Junction Transistor : Construction, types, C-E,C-B and C-C configurations (mention only), VI characteristics of a transistor in C-E mode, Regions of operation (active, cut off and saturation), leakage currents (mention only), Current gains a , ß and and their inter-relations, dc load line and Q point. Applications of transistor as amplifier and switch - circuit and working. (Numerical examples wherever applicable).

Transistor Biasing and Stabilization Circuits : Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor. Transistor as a two-port network, h-parameter equivalent circuit. Amplifier: Small signal analysis of single stage C-E amplifier using h- parameters. Input and Output impedances, Current and Voltage gains. Advantages of C-C amplifier. Class A, B and C Amplifiers (qualitative).Types of coupling, Two stage RC Coupled Amplifier – circuit, working and its Frequency Response, loading effect, GBW product, Darlington transistor, Current gain.

UNIT-4 : NUMBER SYSTEMS and LOGIC GATES **10 Hours**

Number System : Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, Binary arithmetic; addition, subtraction by 1's and 2's complement method, BCD code (8421, 2421, Excess-3), Gray code, error checking and correction codes (Only parity check). Boolean Algebra : Constants, variables, operators, basic logic gates-AND, OR, NOT, Positive and negative logic, Boolean laws, Duality Theorem, De Morgan's Theorem,. Derived logic gates (NAND, NOR, XOR & XNOR). Universal property of NOR and NAND gates. (Numerical examples wherever applicable).

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
I	Network Analysis	15	30	2T/2P	2T/2P	2T	30
II	Diode and It's Applications	15	30	2T/2P	2T/2P	2T	30
III	Bjt and Its Application	15	30	2T/2P	2T/2P	2T	30
IV	Number Systems and Logic Gates	15	30	2T/2P	2T/2P	2T	30
	TOTAL	**60**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1.	a)	2 marks
	b)	5 marks
	c)	8 marks

or

2.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 2

3.	a)	2 marks
	b)	5 marks
	c)	8 marks

or

4.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 3

5.	a)	2 marks
	b)	5 marks
	c)	8 marks

or

6.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 4

7.	a)	2 marks
	b)	5 marks
	c)	8 marks

or

8.	a)	2 marks
	b)	5 marks
	c)	8 marks

Reference Books :

1. Robert L Boylestad, "Introductory circuit analysis", 5th edition., Universal Book 2003.
2. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand and Company Ltd. 2011
3. A.P. Malvino, "Principles of Electronics", 7th edition .TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
5. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
8. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
9. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
10. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001,PHI Learning.
11. M. Nahvi& J. Edminister, "Electrical Circuits", Schaum's Outline SeriesTMGH2005
12. S. A. Nasar," Electrical Circuits", Schaum's outline series, Tata McGraw Hill, 2004
13. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill, 2001
14. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6th Edn., Oxford University Press, 2014
15. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum's outline Series, TMG1991

DEPARTMENT OF ELECTRONICS

Semester-I

Course Title	FUNDAMENTALS OF ELECTRONICS: ELE -1	CIA Marks	20
Course Code	121DSC01P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives : This course (121DSC01P) will enable the students to

Provide students with learning experiences that provide broad knowledge and understanding of key concepts of Electronics and equip students with advanced scientific / technological capabilities for analysing and tackling then issues and problems in the field of Electronics

Course Outcome : After successful completion of the course, students are able to;

121DSC01P.1 - Build simple electronic circuits used in various applications.
121DSC01P.2 – Reproduce the VI characteristics of diode/BJT devices
121DSC01P.3 – Describe the frequency response of BJT amplifiers
121DSC01P.4 – Understand the basic knowledge of Digital system building blocks, effectively can construct simple digital designs with the knowledge of Boolean algebra

Mapping of CO with PO and PSO :

CO	PO										PSO (PE/ME)
	1	2	3	4	5	6	7	8	9	10	
121DSC01P.1	3	3				1					3
121DSC01P.2	3	3	2			1	2	3		1	3
121DSC01P.3	3	3		2		3					3
121DSC01P.4	3	3	2	3		1	1			1	3

Course Content

Demonstration Experiment: Familiarization with

a) Electronic components
b) Resistance in series, parallel and series-parallel
c) Capacitors and inductors in series and parallel
d) Multimeter and LCR meter – checking of components / measurements.
e) Voltage sources in series, parallel and series-parallel
f) Voltage and current dividers
g) Measurement of Amplitude, Frequency & Phase difference using Oscilloscope

Part A (Any Six)

1. Verification of Thevenin's and Norton's Theorem.
2. Verification of Maximum Power Transfer
3. Verification of Superposition Theorem.
4. Study of the VI Characteristics of (a) P-N junction diode (b) Zener diode.
5. Study of Half wave rectifier without and with shunt capacitor filter– ripple factor for different

values of filter capacitors.

6. Study of full wave bridge rectifier without and with shunt capacitor filter – ripple factor for different values of filter capacitors.
7. Study of Zener diode as a Voltage Regulator using bridge rectifier with shunt capacitor filter [Load and line regulation].
8. Study of Clipping, Clamping and Voltage Multiplier circuits.
9. Designing and testing of fixed positive and negative voltage regulators using 78xx and 79xx series ICs (Using bridge rectifier and shunt capacitor filter).
10. Designing and testing of variable voltage regulator using IC LM317 (Using bridge rectifier and shunt capacitor filter).

Part B (Any Six experiments)

1. Study of Transistor characteristics in CE configuration – determination of h- parameters.
2. Study of Fixed Bias and Voltage divider bias circuits – comparison for different values of ß.
3. Study of single stage RC coupled C-E amplifier (frequency response, input and output impedances in mid-band)
4. Study of two-stage RC-coupled CE amplifier (AV1, AV2, AV) at mid-band frequency.
5. Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates using corresponding ICs. Realization of XOR and XNOR using basic gates.
6. Universal property of NAND and NOR gates.
7. Binary to Gray and Gray to Binary code conversion.

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**30**

DEPARTMENT OF ELECTRONICS

Semester-I

Course Title	Domestic Equipment Maintenance and measuring Instruments LAB	CIA Marks	20
Course Code	121SBC01P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives : This course (121SBC01P) will enable the students to

1. Apply knowledge of logical thinking and basic science for solving Electronic related issues

Course Outcome: After successful completion of the course, students are able to;

121SBC01P.1 - Ability to perform Electronic experiments, as well as to analyse and interpret data.
121SBC01P.2 - Ability to perform Electronic experiments, as well as to analyse and interpret data.

Mapping of CO with PO and PSO :

CO	PO										PSO (PE/ME)
	1	2	3	4	5	6	7	8	9	10	
121SBC01P.1	3		3	3		3					3	
121SBC01P.2	3		3	3		3					3	

Course Content

SBC Laboratory Skill Experiments

Unit-1 **15 Hours**

Basics of Electronics: concept of Voltage, Current, Power, AC and DC sources. Ohms law. Electronic Components: Passive components, resistors, imductors, capacitors, and their types. Series and parallel combination, semiconductor diode- ideal and practical diode, VI characteristics, Zener diode- Construction, working and its VI characteristics. application of semiconductor diode as full wave rectifier, ripple factor and its efficiency. Zener diode as voltage regulator. Block diagram of regulated power supply

Experiments.

1. Charging of Capacitors (Parallel combination, Series combination etc.,),
2. Measurement of Resistors using Ohm meter, Measurement of Capacity of a capacitor.
3. Semiconductor diode V-I Characteristics,
4. Half Wave Rectifiers/ Full Wave Rectifier
5. Zener diode Charaacteristics
6. Zener as voltage regulator using full wave rectifier
7. Using Resistive network study of star to delta network conversion or vice-versa. Show that they are equivalent.

Unit-2 **15 Hours**

Measuring Instruments : Analog and digital instruments, permanent magnet moving mechanism, converting basic meter into DC multirange voltmeter and multirange ammeter. Ohmmeter-series and shunt type (qualitative), multimeter. CRO: application of CRO for measurement of voltage, and frequency. Lissajous figures.

Experiments :

1. Measurement of voltage, current using multimeter, construction of multirange voltmeter, current meter.
2. Conversting basic meter into D. C. Voltmeter/Ammeter
3. Measurement of voltage and frequency using CRO, Lissajous figures
4. Soldering and desoldering Tecnique: Students will acquire a skill of soldering discrite components of a given circuit on general PCB and check the working of the circuit.
5. Experimental study of KVL and KCL using DC source and resistive network.
6. Calibration of analog voltmeter and ammeter.
7. Basics and working of Battery Eliminators/ battery charger

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**30**

DEPARTMENT OF ELECTRONICS

Semester-I

Course Title	Basic Electronics-I	CIA Marks	40
Course Code	121OEC01T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	39	Examination Hours	2.5 hour

Course objectives : This course (121OEC01T) will enable the students to

1. Understand basics of Electronics principles.
2. Understand Application of DC and AC to Passive components.

Course Outcome : After successful completion of the course, students are able to;

121OEC01T.1 – Explain basics of Electronics and Electricity.
121OEC01T.2 – Employ Application of DC and AC to Passive components.
121OEC01T.3 – Analyze circuits

Mapping of CO with PO and PSO :

CO	PO										PSO (PE/ME)
	1	2	3	4	5	6	7	8	9	10	
121OEC01T.13	3		3				3			3	
121OEC01T.23	3		3				3			3	
121OEC01T.33	3		3				3			3	

Course Content :

Unit-1 **14 Hours**

Introduction to Electronics and Principles of Electricity:

Introduction to Electronics : Electronics and its scope: Development of vacuum tube devices, semiconductor devices, integrated circuits, microprocessors and microcontrollers. Applications of electronics–entertainment, communication, defense, industrial, medical Impact of electronics on quality of life

Principles of Electricity : Charge-positive and negative charges, properties of charges, charge of an electron, number of electrons in one Coulomb of charge, electric current-definition, its unit and direction of current - conventional current and the electronic current. Potential differenceanditsunitrelatedtoelectric circuit, Ohm's law-statement and limitations, application to circuits. Resistance and its unit, electric power,electric energy. Combinations of resistors, open and short circuit. Kirchhoff's current law and Kirchhoff's voltage law, current and voltage division.

Sufficient number of numerical problems must be solved.

Unit-2 **14 Hours**

Passive Electronic components, Application of DC and AC to Passive components Passive Electronic components: Introduction, resistors, types of resistors, capacitors, principle of capacitor, energy stored in a capacitor, types of capacitors, and combination of capacitors. Inductors, self-inductance, mutual-inductance, combination of inductors, energy stored in an inductor, choke, transformer, types of transformer, transducers, loudspeaker, microphone

Application of DC and AC to Passive components : RC time constant, charging of capacitor (growth voltage), discharging of capacitor through resistor (decay voltage),L/R time constant, growth and decay of current through R-L circuit. AC applied to passive component: LCR series , resonance circuit, quality factor, bandwidth, RC low pass and high pass filter.

Sufficient number of numerical problems must be solved

Unit-3 **14 Hours**

Current and voltage sources and Network theorems :

Current and voltage sources : Sources of electric power, internal impedance of a source, Concept of voltage source : ideal voltage source, practical voltage source. Concept of current source: ideal current source, practical current source, equivalence between voltage source and current source, conversion of voltage source into current source and vice versa.

Network Theorems : Thevenin's, Norton's theorem statement and proof, Superpositiontheorem, statement, analysis with two voltage sources and Maximum power transfer theorem- statement (derivation) all theorems with respect to DC circuit.

Sufficient number of numerical problems must be solved.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
I	Introduction to Electronics and Principles of Electricity	13	32	3T	2T	2T	32
II	Passive Electronic components, Application of DC and AC to Passive components Passive Electronic components	13	45	3T	3T	3T	45
III	Current and voltage sources and Network theorems	13	43	2T	3T	3T	43
	TOTAL	**39**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
2.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 2

3.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
4.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 3

5.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
6.	a)	2 marks
	b)	5 marks
	c)	8 marks

UNIT 4

7.	a)	2 marks
	b)	5 marks
	c)	8 marks
	or	
8.	a)	2 marks
	b)	5 marks
	c)	8 marks

Reference Books :

1. Basics of Electronics (Solid State) – BL Theraja
2. Basics Electronics and linear circuits – N N Bhargava and others.
3. Electronic principles -- B. Basavaraja Vol-1
4. Handbook of Electronics—Gupta Kumar
5. Basic and applied Electronics – bandyopadhyay
6. Electronics-- Dr. R. K. Kar
7. Electronic Devices and Circuits – David A. Bell
8. Principles of Electronics – V. K. Mehta and Rohit Mehta

DEPARTMENT OF ELECTRONICS

Semester-II

Course Title	ANALOG And DIGITAL ELECTRONICS	CIA Marks	40
Course Code	121DSC02T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	60	Examination Hours	3

Course objectives : This course (121DSC02T) will enable the students to

Upon completing the syllabus contents of 121DSC02T, the student will become familiar with various working principles of widely used electronic devices, linear and digital ICs which help the students to build small projects and also be able to answer some basic questions that appear in competitive examinations.

Course Outcome : After successful completion of the course, students are able to;

121DSC02T.1 - Reproduce the VI characteristics of various MOSFET devices.
121DSC02T.2 - Apply standard device models to explain/calculate critical internal parameters of Semiconductor devices.
121DSC02T.3 - Understand basic logic gates, concepts of Boolean algebra
121DSC02T.4 -. Analyze combinatorial and sequential circuits

Mapping of CO with PO and PSO :

CO	PO										PSO (PE/ME)
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
121 DSC02T.1	3	3				1					3
121 DSC02T.2	3	3	2			1	2	3		1	3
121 DSC02T.3	3	3		2		3					3
121 DSC02T.4	3	3	2	3		1	1			1	3

Course Content

UNIT-1 **Analog Electronics** **15 Hours**

JFET : Types - p-channel and n-channel, working and VI characteristics, n-channel JFET, parameters and their relationships, Comparison of BJT and JFET.

MOSFET : Depletion and enhancement type MOSFET, n-channel and p-channel, Construction, working, symbols, biasing, drain and transfer characteristics, VMOS, UMOS Power MOSFETs, handling, MOS logic, symbols and switching action of MOS, NMOS inverter, CMOS logic, CMOS – inverter, circuit and working, CMOS characteristics, IGBT construction and working.

UJT - construction, working, equivalent circuit and VI characteristics, intrinsic stand-off ratio, relaxation oscillator.

SCR - Construction, VI characteristics, working, symbol, and applications – HWR and FWR. Diac and Triac-construction, working, characteristics, applications, (Numerical examples wherever applicable)

UNIT- 2 **15 Hours**

Op-Amp : Differential Amplifier, Block diagram of Op-Amp, Characteristics of an Ideal and Practical Op-Amp, Open and closed loop configuration, Frequency Response, CMRR, Slew Rate and concept of Virtual Ground.

Applications of op-amps : Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative Study). Inverting and non-inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Comparator and Zero-crossing detector Filters: First and second order active low pass, high pass and band pass Butterworth filters. Oscillators: Barkhausen criterion for sustained oscillations, Collpitt's oscillator and crystal oscillators using transistor, Phase Shift oscillator, Wien-bridge oscillator – (no derivation for each) IC 555Timer: Introduction, Block diagram, Astable and Monostable multivibrator circuits. (Numerical Examples wherever applicable).

DIGITAL ELECTRONICS

UNIT-3 COMBINATIONAL LOGICAL CIRCUITS and DATA CONVERTERS **15 Hours**

Logic Families : Pulse characteristics, Logic Families-classification of digital ICs. Characteristics of logic families, circuit description of TTL NAND gate with totem pole and open collector. TTL IC terminology. CMOS NAND, comparison of TTL and CMOS families. Combinational Logic Circuits: Minimisation techniques using K-maps - SOP and POS, Minterm, Maxterm, SSOP, SPOS, Simplification of Boolean expressions, KMap for 3 and 4 variable.

Design of Arithmetic logic circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, 4-bit parallel binary adder, 2-bit and 4-bit magnitude comparator. Encoder, decimal to BCD priority encoder. Decoder, 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder, BCD to 7-Segment decoder, Multiplexer - 4:1 and 8:1 multiplexer, Demultiplexer, 1:4 and 1:8 demultiplexer - logic diagram and truth table of each, Realization of Full adder and Full Subtractor using Mux and Decoder.

Digital to Analog converter: DAC with binary weighted resistor and R-2R resistor ladder network. Analog to Digital converter: Successive approximation method -performance characteristics.

UNIT - 4 **15 Hours**

SEQUENTIAL LOGIC CIRCUITS and it's APPLICATIONS

SEQUENTIAL LOGIC CIRCUITS : Flip-Flops - SR Latch, RS, D and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Racearound conditions in JK Flip-Flop. Master- Slave JK and T Flip-Flops. Applications of Flip-Flops in semiconductor memories, RAM, ROM and types.

Registers and Counters : Types of Shift Registers, Serial-in-Serial-out, Serial-in Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits), applications. Ring counter, Johnson counter applications. Asynchronous Counters: Logic diagram, Truth table and timing diagrams of 4 bit ripple counter, modulo-n counters,4bit Up- Down counter, Synchronous Counter, 4-bit counter, Design of Mod 3, Mod 5 and decade Counters using K-maps.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
I	Analog Electronics	15	30	2T/2P	2T/2P	2T	30
II	Operational Amplifier and Its Applications ,IC 555	15	30	2T/2P	2T/2P	2T	30
III	Digital Electronics	15	30	2T/2P	2T/2P	2T	30
IV	Sequential Logic Circuits and It's Applications	15	30	2T/2P	2T/2P	2T	30
	TOTAL 60	**120**	**16**	**40**	**64**	**120**	

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1. a) 2 marks
   b) 5 marks
   c) 8 marks

or

2. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 2

3. a) 2 marks
   b) 5 marks
   c) 8 marks

or

4. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 3

5. a) 2 marks
   b) 5 marks
   c) 8 marks

or

6. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 4

7. a) 2 marks
   b) 5 marks
   c) 8 marks

or

8. a) 2 marks
   b) 5 marks
   c) 8 marks

Reference Books :

1. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
2. Electronic Devices Conventional Current Version by Thomas L. Floyd
3. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015.
4. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn, 2000, Prentice Hall.
5. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.
6. R.S.Sedha, "A Text book of Applied Electronics", 7th edition.,S.Chand and Company Ltd. 2011.
7. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994))
8. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
9. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
10. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
11. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
12. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGrawHill (1994)
13. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

DEPARTMENT OF ELECTRONICS

Semester-II

Course Title	ANALOG AND DIGITAL ELECTRONICS	CIA Marks	20
Course Code	121DSC02P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	40	Examination Hours	3

Course objectives : This course (121DSC02P) will enable the students to

1. Understand the working of FET,UJT,SCR.TRIC,DIAC
2. Understand the working of OP-AMP and Timer circuits
3. Test the working of MUX and DeMUX. D/A convertors
4. Understand the Working of flip flop, registers and counters Counters

Course Outcome : After successful completion of the course, students are able to;

121DSC02P.1- To demonstrate working of characteristics of different analog components
121DSC02P.2-. To demonstrate working of operational amplifier
121DSC02P.3 - Construct basic combinational circuits and verify their functionalities
121DSC02P.4 - Apply the design procedures to design basic sequential circuits.

Mapping of CO with PO and PSO :

CO	PO										PSO (PE/ME)
	1	2	3	4	5	6	7	8	9	10	
121DSC02P.1	1			3		2				2	3
121DSC02P.2	1			3		2				2	3
121DSC02P.3	1			3		2				2	3
121DSC02P.4	1			3		2				2	3

Course Content

PART- A (Any Six)

1. Study of JFET/MOSFET characteristics – determination of parameters.
2. Study of single stage JFET amplifier.(frequency response and band width)
3. UJT characteristics and relaxation oscillator
4. SCR characteristics – determination of IH and firing voltage for different gate currents.
5. Design of inverting and non-inverting amplifier using Op-amp & study of frequency response.
6. Op-amp inverting and non-inverting adder,subtractorand averaging amplifier.
7. Study of the zero-crossing detector and comparator.
8. Design and study of differentiator and integrator using op-amp for different input waveforms.
9. Design and study of Wien bridgeand RC phase shift oscillator using op-amp.
10. Design and study of first order high-pass and low-pass filters using op-amp.
11. Study of Collpitt's and crystal oscillator using transistor.
12. Astable multivibrator using IC555 timer.
13. Monostable multivibrator using IC555 timer

PART- B (Any Six)

14. Half Adder and Full Adder using (a) logic gates (b) using only NAND gates.
15. Half Subtractor and Full Subtractor(a) logic gates (b) using only NAND gates.
16. 4 bit parallel binary adder and Subtractor using IC7485.
17. Study of BCD to decimal decoder using IC7447
18. Study of the Encoders and priority encoders.
19. Study of Multiplexer and Demultiplexer using ICs.
20. Study of 2-bit and 4-bit magnitude comparators.
21. Study of Clocked RS, D and JK Flip-Flops using NAND gates.
22. Study of 4-bit asynchronous counter using JK Flip-Flop IC7476, modify to decade counter and study their timing diagrams.
23. Study of 4-bit Shift Register – SISO, modification to ring counter using IC 7495.
24. Digital to Analog converter using binary weighted resistor method, determination of resolution, accuracy and linearity error.

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**30**

DEPARTMENT OF ELECTRONICS

Semester-II

Course Title	OEC-Basic Electronics-II	CIA Marks	40
Course Code	121OEC02T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	39	Examination Hours	2.5

Course objectives : This course (121OEC02T) will enable the students to

1. To introduce the operation of semiconductor device
2. Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their application

Course Outcome: After successful completion of the(121OEC02T) course, students are able to;

121OEC02T.1 – Demonstrate and analyse the behaviour of semiconductor devices
121OEC02T.2 – Demonstrate the switching, amplificationand control application of the semiconductor Devices.
121OEC02T.3 – To introduce students to the basic theory of power supply

Mapping of CO with PO and PSO :

CO	PO										PSO-1 (PC)	PSO-1 (PM)	PSO-1 (PE)	PSO-1 (PCS)
	1	2	3	4	5	6	7	8	9	10				
121OEC02T.1	3	3		3		3		2		3	3	3	3	3
121OEC02T 2	3	3		3		3		2		3	3	3	3	3
121OEC02T.3	3	3		3		3		2		3	3	3	3	3

Course Content

UNIT-1

Semiconductor Theory : Semiconductors: Semiconductor materials,structure of an atom, atomic structure of some elements, electron energies, energy bands in solids, metals, insulators,semiconductors,hole formation and its movement, types of semiconductors,intrinsic semiconductors, extrinsic semconductors, electron current and hole current, N-type and P-type semiconductor, majority and minority charge carriers,effect of temperaure on extrinsic semiconductors.

Sufficient number of numerical problems must be solved. **14 Hours**

UNIT-2

Semiconductor Diode and its application: P-N junction theory, effect of temperature on barrier potential,current components in an open circuited P-N junction, biasing P-N junction, forward bias P-N junction, reverse bias P- N junction. Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance. Half- wave rectifier, PIV, average value voltage and load current, rms value, ripple factor, effciency of rectification. Full-wave rectifier, Peak Inverse Voltage,average values of output voltage and load

current, rms value of load current, ripple factor, efficiency of rectification, Bridge rectifier working and comparision of rectifiers.

Sufficient number of numerical problems must be solved. **14 Hours**

UNIT-3

Power Supply: Block diagram of power supply, unregulated power supply, voltage regulation, load regulation, importance of filters in power supply, shunt capacitor filter, its ripple factor, LC-section filter ,CLC filter, ripple factor, and comparision of these filters. Zener diode : constructon working and its V-I characterstics, Zener diode as voltage regulator–circuit diagram, load and line regulation, disadvantages. **14Hours**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	10 marks	Total marks
I	Semiconductor theory	13	32	3T	2T	2T	32
II	Semiconductor diode and its applications	13	45	3T	3T	3T	45
III	Power supply	13	43	2T	3T	3T	43
	TOTAL	**39**	**120**	**16**	**40**	**64**	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1. a) 2 marks
   b) 5 marks
   c) 8 marks

or

2. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 2

3. a) 2 marks
   b) 5 marks
   c) 8 marks

or

4. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 3

5. a) 2 marks
   b) 5 marks
   c) 8 marks

or

6. a) 2 marks
   b) 5 marks
   c) 8 marks

UNIT 4

7. a) 2 marks
   b) 5 marks
   c) 8 marks

or

8. a) 2 marks
   b) 5 marks
   c) 8 marks

Reference Books :

1. Basics of Electronics (Solid State) – BL Theraja
2. Basics Electronics and linear circuits – N N Bhargava and others.
3. Electronic principles -- B. Basavaraja Vol-1
4. Handbook of Electronics—Gupta Kumar
5. Basic and applied Electronics – bandyopadhyay
6. Electronics-- Dr. R. K. Kar
7. Electronic Devices and Circuits – David A. Bell
8. Principles of Electronics – V. K. Mehta and Rohit Mehta

Department of Biotechnology

Semester I- 122-DSCC-01T- Cell Biology and Genetics (NEP)

Course Title	Cell Biology and Genetics	CIA Marks	40
Course Code	122-DSCC-01T	SEE Marks	60
Scheme L:T:P)	4:0:0	Credits	4
Teaching hours	56	Examination Hours	3

Course objectives : This course (122-DSCC-01T) will enable the students to

1. To understand and apply the principles and techniques of molecular biology
2. To make the students to understand the concept of gene, modulation of gene its regulation, modes of transmission and defects
3. To teach the advanced knowledge in a specialized field of molecular and cell biology

Course Outcome : After successfully completion of the course, student are able to;

122-DSCC-01T.1 Recall the history of cytology and draw the structure of prokaryotic, eukaryotic, cell organelles and locate its parts along with functions.

122-DSCC-01T.2 Explain the organization of chromosomes, chromosome morpholoogy and its aberrations and Compare and contrast the events of cell cycle and its regulation.

122-DSCC-01T.3 Summarize molecular genetics based on Mendel's concepts and Deviations to Mendelian inheritance

122-DSCC-01T.4 Explain linkage, DNA mutation, Chromosomal variations, Sex Determination in Plants and animals and Human Genetics

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-DSCC-01T.1	1	1		3	1	3					3	3	3	1	1
122-DSCC-01T.2	3	3	1	3	1	3			1	3	3	3	3	3	3
122-DSCC-01T.3	3	3	1	3	1	3			1	3	3	3	3	3	3
122-DSCC-01T.4	3	3	1	3		3			1	3	3	3	3	3	3

Course Content :

Unit – 1: Cell as a Basic unit of Living Systems and Cellular Organelles 14Hrs

Concept, Development and Scope of Biotechnology. Historical perspectives. Discovery of cell, the cell Theory, Ultra structure of Prokaryotic and Eukaryotic cell - (Both plant and animal cells), Surface Architecture: Structural organization and functions of plasma membrane and cell wall of eukaryotes.

Cellular Organelles : Structure and functions of cell organelles – Endoplasmic reticulum, Golgi complex, Mitochondria, Chloroplast, Ribosomes, Lysosomes, Peroxisomes, Nucleus (Nuclearenvelope with nuclear pore complex, Nucleolus, Nucleoplasm and Chromatin). Vacuole, Cytosol and Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments).

Unit- 2: Chromosomes and Cell Division **14Hrs**

General Introduction, Discovery, Morphology and structural organization – Centromere, Secondary constriction, Telomere, Chromonema, Euchromatin and Heterochromatin, Chemical composition and Karyotype. Single-stranded and multi-stranded hypothesis, folded- fibre and nucleosome models.

Special type of chromosomes: Salivary gland and Lamp brush chromosmes.

Cell Division: Cell cycle, phases cell division. Mitosis and meiosis, regulation of cell cycles cell cycle checkpoints, and enzymes involved in regulation, Significance of cell cycle, mitosis and meiosis interphase nucleus, achromatic apparatus, synaptonemal complex Cell Cycle and regulation, mitosis and meiosis. Cell Senescence and programmed cell death.

Unit-3 : Genetics **14Hrs**

History of genetics : Introduction and brief history of genetics. Mendelian theory: Laws of inheritance- dominance, segregation, incomplete dominance, codominance with an example. Law of independent assortment, test cross, back cross. Deviations to Mendelian inheritance, complementary, supplementary and interaction of genes (13:3 ratio), epistasis, Pedigree analysis

Maternal Inheritance : Plastid inheritance in Mirabilis, Petite characters in yeast and Kappa particles in paramecium, Sex-linked inheritance, Chromosome theory of inheritance.

Gene interaction : Supplementary factors: comb pattern in fowls, Complementary genes- Flower colour in sweet peas, Multiple factors–Skin colour in human beings, Epistasis– Plumage colour in poultry, Multiple allelism: Blood groups in Human beings.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	10 marks	Total marks
1	Cell as a Basic unit of Living Systems and Cellular Organelles	14	30	2	2	2	30
2	Chromosomes and Cell Division	14	30	2	2	2	30
3	Genetics:	14	30	2	2	2	30
4	A. Linkage and Crossing Over	14	30	2	2	2	30
	Total 56	**120**	**08**	**08**	**08**	**120**	

Semester End Theory Question paper pattern **Total Marks =60**

Q.I	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.II	Answer the following (a,b,c)	2,5,8=15
Q.III	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.IV	Answer the following (a,b,c)	2,5,8=15
Q.V	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.VI	Answer the following (a,b,c)	2,5,8=15
Q.VII	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.VIII	Answer the following (a,b,c)	2,5,8=15

Reference Book :

1. Molecular Biology of Cell - Bruce Alberts et al, Garland publications.
2. Animal Cytology and Evolution- MJD, White Cambridge University Publications
3. Molecular Cell Biology-Daniel, Scientific American Books
4. Cell Biology - Jack d Bruke, The William Twilkins Company
5. Principles of Gene Manipulations- Old & Primrose, Black Well Scientific Publications
6. Cell Biology - Ambrose & Dorothy M Easty, ELBS Publications
7. Fundamentals of Cytology- L. W. Sharp, McGraw Hill Company
8. Cytology-Willson & Marrison, Reinform Publications
9. Molecular Biology- Christopher Smith, Faber & Faber Publications
10. Cell Biology & Molecular Biology – EDP De Robertis& EMF Robertis, Saunder College.
11. Cell Biology- C. B Powar, Himalaya Publications
12. Basic Genetics- Daniel L. Hartl, Jones & Barlett Publishers USA
13. Human Genetics and Medicine lark Edward Arnold P London
14. Genetics – Monroe W Strickberger, Macmillain Publishers, New York
15. Genes V - Benjamin Lewin, Oxford University Press.
16. Genes I - Benjamin Lewin, Wiley Eastern Ltd., Delhi
17. Genes II - Benjamin Lewin, Wiley & Sons Publications
18. Genes III- Benjamin Lewin, Wiley & Sons Publications
19. Principles of Genetics- Sinnott, L. C. Dunn, Dobzhansky, McGraw-Hill.
20. Genetics – Edgar Altenburg Oxford & IBH publications
21. Principles of Genetics – E. J. Gardener, M. J. Simmons and D. P. Snustad, John Wiley & Son Publications
22. Genetics- P. K. Gupta, Rastogi Publication, Meert, India

Department of Biotechnology

Semester I- 122-DSCC-01P- Cell Biology and Genetics (NEP)

Course Title	Cell Biology and Genetics	CIA Marks	20
Course Code	122-DSCC-01P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	32	Examination Hours	3

Course objectives: This course (122-DSCC-01P) will enable the students to

1. Learn the Handling of microscope
2. Understand the cell division: Mitosis and Meiosis
3. Learn the staining of a cell or organism to observe it under light microscope
4. Demonstration of karyotype Analysis and solve genetic problems

Course Outcome : After successfully completion of the course, student are able to;

122-DSCC-01P.1 Handling of microscope- studying the different parts of microscope, its construction.

122-DSCC-01P.2 Observation of the objects, cells and microscopic organisms under the microscope by Micrometer.

122-DSCC-01P.3 Mitotic slide preparation of onion root tips and observation of all cell divisions and meiosis slide preparation in grasshopper testes/onion orRhoeo flower buds.

122-DSCC-01P.4 Staining techniques- staining of a cell or organism to observe it under light microscope

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-DSC-01P.1	3	3	1	3	1	3		1		3	3	3	3	3	3
122-DSC-01P.2	3	3	1	3	1	3			1	3	3	3	3	3	3
122-DSC-01P.3	3	3	3	3	1	3		1		3	3	3	3	3	3

Course Content :

1) Study and maintenance of simple and compound microscope
2) Use of Micrometer and calibration, measurement of onion epidermal cells and yeast
3) Study of divisional stages in mitosis from onion root tips
4) Study of divisional stages in meiosis in grasshopper testes/onion or Rhoeo flower buds.
5) Mounting of polytene chromosomes
6) Buccal smear - Barr bodies
7) Karyotype analysis - Human and Onion
   Human – Normal and Abnormal – Down and Turner's syndromes
8) Isolation and staining of Mitochondria
9) Isolation and staining of Chloroplast
10) RBC cell count by Haemocytometer
11) Simple genetic problems based on theory

- ***Note: Each student is required to submit 5 permanent slides of mitosis & meiosis**

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

Semester End Practical paper pattern **Total Marks =40**

Q.I	Major Question	15
Q.II	Minor I question	10
Q.III	Minor II question /Scheme writing/Spotting	05
Q.IV	Viva Voce	05
Q.V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology, Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

Department of Biotechnology

Semester I- 122-OEC-01T - Biotechnology for Human Welfare

Course Title	Biotechnology for Human Welfare	CIA Marks	40
Course Code	122-OEC-01T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	3

Course objectives: This course (122-OEC-01T) will enable the students to

1. Biotechnology for human welfare aims to provide introduction of various fields of biotechnology e.g. Agricultural, pharmaceutical and industrial biotechnology and their contribution for human welfare.
2. It aims at gaining an understanding of current experimentation in biotechnology and genetic engineering.
3. The course imparts knowledge regarding benefits of biotechnology in forensic science and crime detection by employing various molecular biology techniques.

Course Outcome : After successfully completion of the course, student are able to;

122-OEC-01T.1 Outline the Application of biotechnology in industry, environment, health and forensic science.

122-OEC-01T.2 Explain the techniques used in various application of biotechnology.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-OEC-01T.1	1	3	3	3	1	3		3		3	3		3	3	3
122-OEC-01T.12	1	3	3	3	1	3		3		3	3		3	3	3

Course Content :

Unit – I: Industry **14 Hours**

Application of biotechnology in industry :

Industrial production of alcoholic beverage (wine), antibiotic (Penicillin), enzyme (lipase) Protein engineering applications in food, detergent and pharmaceutical industry.

Unit – II: Environment **14 Hours**

Application of biotechnology in environmental aspects:

Degradation organic pollutants - chlorinated and non-chlorinated compounds; degradation of hydrocarbons and agricultural wastes, PHB –production and its futuristic applications.

Unit – III: Forensic science **14 Hours**

Application of biotechnology in forensic science:

Solving crimes of murder and rape; solving claims of paternity and theft by using DNA finger printing techniques.

Health:

Application of biotechnology in health:

Genetically engineered insulin, recombinant vaccines, gene therapy, molecular diagnostics using ELISA, PCR; monoclonal antibodies and their use in cancer; human genome project

Teaching Pedagogy :

Chalk and talk, Power point Presentation, etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	10 marks	Total marks
1	Industry 14	40	3	2	3	40	
2	Environment14	40	2	4	2	40	
3	Forensic science	14	40	3	2	3	40
	Total	**42**	**120**	**08**	**08**	**08**	**120**

Semester End Theory Question paper pattern **Total Marks =60**

Q.I	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.II	Answer the following (a,b,c)	2,5,8=15
Q.III	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.IV	Answer the following (a,b,c)	2,5,8=15
Q.V	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.VI	Answer the following (a,b,c)	2,5,8=15
Q.VII	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.VIII	Answer the following (a,b,c)	2,5,8=15

Reference Book :

1. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
2. Patel A. H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
3. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
4. Environmental Biotechnology, Pradipta Kumar Mohapatra
5. Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening and Jesef Winter
6. B. B. Nanda and R. K. Tiwari, Forensic Science in India: A Vision for the Twenty First
7. Century, Select Publishers, New Delhi (2001).
8. M. K. Bhasin and S. Nath, Role of Forensic Science in the New Millennium, University of Delhi, Delhi (2002).
9. S. H. James and J. J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
10. W. G. Eckert and R. K. Wright in Introduction to Forensic Sciences, 2nd Edition, W. G. Eckert (ED.), CRC Press, Boca Raton (1997).

Semester I - 122-SBC-01P - Biotechnological Skills and Analytical Techniques

Course Title	Biotechnological Skills and Analytical Techniques	CIA Marks	20
Course Code	122-SBC-01P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	30	Examination Hours	3

Course objectives : This course (122-SBC-01P) will enable the students to

1. Learn the use of computer for the representation of scientific data.
2. Develop Biotechnologyl skills used in the laboratory for the cultivation, identification, observation and preservation of microbes.
3. Learn to operate the analytical instruments regularly used in the Biotechnology laboratories.

Course Outcome : After successfully completion of the course, students are able to;

122-SBC-01T.1- Demonstrate basic practices and maintenance of lab, lab ware and storage of chemicalsin biotechnology laboratory

122-SBC-01T.2- Experiment withstandard operating procedures (SOP) and Usage of basic equipment of biotechnology lab.

122-SBC-01T.3- Solve the accuracy in calculations for preparation solutions.

122-SBC-01T.4- Adapt the Practical methods for preparation of media ,decontamination, disposaland in writingLaboratory record scientifically

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-SBC-01T.1	3	3		3	3	3				3			3	3	3
122-SBC-01T.2	3	3		3	3	3				3			3	3	3
122-SBC-01T.3	3	3		3	3	3				3			3	3	3
122-SBC-01T.4-	3	3		3	3	3				3			3	3	3

Course Content :

Unit: 1. Insights into biotechnology industry: **05 Hours**

Biotechnology Industry in Indian and Global context - organization in context of large / medium/ small enterprises, their structure and benefits.

UNIT: 2. Industry professional skills to be acquired: **05 Hours**

Planning and organising skills, decision-making, problem-solving skills, analytical Thinking, critical thinking, team management, risks assessment.

UNIT: 3. Interpersonal skills **08 Hours**

Centrifugation, Chromatography and Spectroscopy: Principles, Types, Instrumentation, Operation and applications.

UNIT: 4. Digital skills **12 Hours**

Basic Computer Skills (MS Office, Excel, Power point, Internet) for Workplace. Professional Email drafting skills and Powerpoint presentation skills

Analytical Skills in laboratory :

Solutions :

Molarity, Molality, Normality, Mass percent % (w/w), Percent by volume (% v/v), parts per million (ppm), parts per billion (ppb), Dilution of concentrated solutions.Standard solutions, stock solution, solution of acids. Reagent bottle label reading and precautions

Blue Print :

Sl.No	**Particulars**	**Marks**
1.	Experimental Skills	15
2.	Principle/Introduction/Mechanism	05
3.	Viva voce	05
4.	Journal	05

Semester End Practical paper pattern **Total Marks =40**

Q.I	Major Question	15
Q.II	Minor I question	10
Q.III	Minor II question /Scheme writing/Spotting	05
Q.IV	Viva Voce	05
Q.V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

Semester II - 122-DSC-02T- Microbiological Methods

Course Title	Microbial Biochemistry and Physiology	CIA Marks	40
Course Code	122-DSC-02T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	56	Examination Hours	3

Course objectives : This course (123-DSC-02T) will enable the students to

1. Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
2. Understand the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis

Course Outcome: After successfully completion of the course, student are able to;

122-DSCC-02T.1 learn the details of classification, structural features and functional aspects of prokaryotic and eukaryotic microorganisms.

122-DSCC-02T.2 Explain the details of microbial techniques for growth, cultivation and characterization of microorganisms..

122-DSCC-02T.3 Demonstrating the Laboratory skills in basic and applied microbiology with reference to technological aspects.

122-DSCC-02T.4 Categorize different Antimicrobial agents and their molecular mechanism

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-DSC-02T 1	1	1		3	1	3					3	3	3	1	1
122-DSC-02T 2	3	3	1	3	1	3				3	3	3	3	3	3
122-DSC-02T 3	3	3	1	3	1	3				3	3	3	3	3	3
122-DSC-02T 4	3	3	1	3		3				3	3	3	3	3	3

Course Content :

Unit – I: Instruments used in Biotechnology **14 Hours**

Microscopy : Principles of Microscopy- resolving power, numerical aperture, working principle and applications of Compound microscope, Dark field microscope, Phase contrast microscope, Fluorescence Microscope, confocal microscope, Electron Microscopes- TEM and SEM.

Analytical techniques : Working principles and applications: Centrifuge, Ultracentrifuge, Spectrophotometer, Chromatography: Paper and TLC.

Unit – II: Sterilization techniques **14 Hours**

Definition of terms-sterilization, disinfectant, antiseptic, sanitizer, germicide, microbicidal agents, microbiostatic agent and antimicrobial agent.

Physical methods of control : Principle, construction and applications of moist heat sterilization Boiling, Pasteurization, Fractional sterilization-Tyndallization and autoclave. Dry heat sterilization-Incineration and hot air oven. Filtration –Diatomaceous earth filter, seitz filter, membrane filter and HEPA ;

Radiation : Ionizing radiation-? rays and non ionizing radiation- UVrays

Chemical methods : Alcohol, aldehydes, phenols, halogen, metallic salts, Quaternary ammoniumcompounds and sterilizing gases as antimicrobial agents.

Unit –III: Microbiological techniques **14 Hours**

Culture Media : Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media

Pure culture methods : Serial dilution and plating methods (pour, spread, streak); cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria

Stains and staining techniques : Principles of staining, Types of stains-simple stains, structural stains and differential stains.

Unit – IV: Antimicrobial agents **14 Hours**

Five modes of action with one example each: Inhibitor of nucleic acid synthesis; Inhibitor of cell wall synthesis; Inhibitor of cell membrane function; Inhibitor of protein synthesis; Inhibitor of metabolism

Antifungal agents : Mechanism of action of Amphotericin B, Griseofulvin

Antiviral agents : Mechanism of action of Amantadine, Acyclovir, Azidothymidine

Antibiotic resistance, MDR, XDR, MRSA, NDM-1

Antibiotic sensitivity testing methods : Disc and Agar well diffusion techniques

Teaching Pedagogy :

Chalk and talk, Power point Presentation, etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
1	Instruments used in Biotechnology	14	30	2	2	2	30
2	Sterilization techniques	14	30	2	2	2	30
3	Microbiological techniques	14	30	2	2	2	30
4	B. Antimicrobial agents	14	30	2	2	2	30
	Total	**56**	**120**	**08**	**08**	**08**	**120**

	Semester End Theory Question paper pattern	Total Marks =60
Q.I	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.II	Answer the following (a,b,c)	2,5,8=2
Q.III	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.IV	Answer the following (a,b,c)	2,5,8=20
Q.V	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.VI	Answer the following (a,b,c)	2,5,8=20
Q.VII	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.VIII	Answer the following (a,b,c)	2,5,8=20

References :

1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T. Brown Publishers.
2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan M T, and Martinko J M. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr M J, Chan ECS, and Krieg N R. (2004). Microbiology.
5. 5th edition Tata McGraw Hill.
6. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
7. Stanier R Y, Ingraham J L, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
8. Tortora G J, Funke B R, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
9. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
10. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
11. Microbiology- Concepts and applications by Paul A. Ketchum, Wiley Publications
12. Fundamentals of Microbiology –Frobisher, Saunders & Toppan Publications
13. Introductory Biotechnology-R. B. Singh C. B. D. India (1990)
14. Fundamentals of Bacteriology - Salley
15. Frontiers in Microbial technology-P.S. Bison, CBS Publishers.
16. Biotechnology, International Trends of perspectives A. T. Bull, G.
17. General Microbiology –C. B. Powar

Semester II - 122-DSC-02P- Microbiological Methods

Course Title	Microbiological Methods	CIA Marks	40
Course Code	122-DSC-02P	SEE Marks	60
Scheme (L:T:P)	0:0:4	Credits	4
Teaching Hours	56	Examination Hours	3

Course objectives: This course (123-DSC-02P) will enable the students to

1. Learn the Preparation of chemicals, solutions, buffers required for the performance of practicals.
2. Learn the techniques of estimations of molecules.
3. Understand the factors affecting microbial growth and estimate in laboratory.

Course Outcome: After successfully completion of the course, student are able to;

122-DSCC-01P.1 Demonstration with important instruments used in the microbiology and Biotechnology laboratory.
122-DSCC-01P.2 Experiment with sterilization efficiency of various sterilization equipments.
122-DSCC-01P.3 Categorize the media, plating and staining techniques for different microbes.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-DSC-02P.1	3	3	3	3	3	3				3			3	3	3
122-DSC-02P.2-	3	3	3	3	3	3				3			3	3	3
122-DSC-02P.3	3	3	3	3	3	3				3			3	3	3
122-DSC-02P.4	3	3	3	3	3	3				3			3	3	3

Course Content :

1. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology and Biotechnology laboratory.
2. Sterilization of medium using Autoclave and assessment for sterility
3. Sterilization of glassware using Hot Air Oven and assessment for sterility
4. Sterilization of heat sensitive material by membrane filtration and assessment for sterility
5. Preparation of culture media for bacteria, fungi and their cultivation.
6. Plating techniques: Spread plate, pour plate and streak plate.
7. Isolation of bacteria and fungi from soil, water and air
8. Study of Rhizopus, Penicillium, Aspergillus using temporary mounts
9. Colony characteristics study of bacteria from air exposure plate
10. Staining techniques: Bacteria– Gram, Negative, Capsule, Endospore staining
    Fungi – Lactophenol cotton blue staining
11. Water analysis - MPN test
12. Biochemical Tests – IMViC, Starch hydrolysis, Catalase test, Gelatin hydrolysis
13. Bacterial cell motility - hanging drop technique

Teaching Pedagogy:

Demonstration, Hands on training, Videos, etc

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Observation table/Calculations/Graph	06
3.	Principle/Introduction/Mechanism	04
4.	Result	02
5.	Viva voce	05
6.	Journal	05

Semester End Practical paper pattern **Total Marks =40**

Q.I	Major Question	15
Q.II	Minor I question	10
Q.III	Minor II question /Scheme writing/Spotting	05
Q.IV	Viva Voce	05
Q.V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology, Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

Semester II- 123-OEC-02T - Applications of Biotechnology in Agriculture

Course Title	Applications of Biotechnology in Agriculture	CIA Marks	40
Course Code	122-OEC-02T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	3

Course objectives : This course (122-OEC-02T) will enable the students to

1. Learn habitats of microbes and their beneficial effects in soil.
2. Understand the distribution of microbes in different waterbodies.
3. Know how microbial infections spread through air, water and food and detection and control of these diseases

Course Outcome : After successfully completion of the course, student are able to;

122-OEC-02T.1- The course helps the students to learn Concepts and scope of biotechnology in Agriculture. Plant tissue culture, micro propagation, entrepreneurship in commercial plant tissue culture.

122-OEC-02T.2- The course also provides information about transgenic plants, plants as biofactories for molecular pharming and genetic engineering for quality improvement.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
122-OEC-02T.1	3	3	3	3	3	3	3	3		3			3	3	3
122-OEC-02T.2	3	3	3	3	3	3	3	3		3			3	3	3
122-OEC-02T.3	3	3	3	3	3	3	3	3		3			3	3	3

Course Content :

Unit – 1: Agricultural Biotechnology **14 Hrs**

Concepts and scope of biotechnology in Agriculture. Plant tissue culture, micro propagation, entrepreneurship in commercial plant tissue culture. Banana tissue culture - primary and secondary commercial setups, Small scale bioenterprises: Mushroom cultivation

Unit – 2: Transgenic plants **14 Hrs**

The GM crop debate – safety, ethics, perception and acceptance of GM crops

GM crops case study: Bt cotton, Bt brinjal

Plants asbiofactories for molecular pharming: edible vaccines, plantibodies, nutraceuticals.

Unit – 3: Bt based pesticides **14 Hrs**

Baculovirus pesticides, Mycopesticides,

Post-harvest Protection : Antisense RNA technology for extending shelf life of fruits and shelf life of flowers.

Genetic Engineering for quality improvement : Seed storage proteins, Flavours–capsaicin, vanillin

Pest control during cultivation, nematode based pesticides production

Teaching Pedagogy :

Chalk and talk, Power point Presentation, etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
1	Agricultural Biotechnology	14	40	3	2	3	40
2	Transgenic plants	14	40	2	4	2	40
3	Bt based pesticides	14	40	3	2	3	40
	Total	**42**	**120**	**08**	**08**	**08**	**120**

Semester End Theory Question paper pattern **Total Marks =60**

Q.I	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.II	Answer the following (a,b,c)	2,5,8=15
Q.III	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.IV	Answer the following (a,b,c)	2,5,8=15
Q.V	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.VI	Answer the following (a,b,c)	2,5,8=15
Q.VII	Answer the following (a,b,c)	2,5,8=15
	OR	
Q.VIII	Answer the following (a,b,c)	2,5,8=15

Reference Book :

1. Prescott, Harley, Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill.
3. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd.
4. Brock Biology of Microorganisms, M. T. Madigan, J. M. Martinko, P. V. Dunlap, D. P. Clark-12th edition, Pearson International edition 2009, Pearson Benjamin Cummings.
5. Microbiology – An Introduction, G. J. Tortora, B. R. Funke, C. L. Case, 10th ed. 2008,Pearson Education.
6. General Microbiology, Stanier, Ingraham et al, 4th and 5th edition 1987, Macmillan education limited.
7. Microbiology- Concepts and Applications, Pelczar Jr,Chan, Krieg, International ed, McGraw Hill.
8. Alexopoulos, C. J., Mims, C. W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp.
9. Atlas, R. M. 1984. Basic and practical microbiology. Mac Millan Publishers, USA. 987pp.

10. Black, J. G. 2008. Microbiology principles and explorations. 7edn. John Wiley and Sons Inc., New Jersey 846 pp.
11. Pommerville, J. C. Alcamo's Fundamentals of Microbiology. Jones and Bartlett Pub. Sudburry, 835 pp.
12. Schlegel, H. G. 1995. General Microbiology. Cambridge University Press, Cambridge, 655 pp.
13. Toratora, G. J., Funke, B. R. and Case, C.L. 2007. Microbiology 9th ed. Pearson Education Pte. Ltd., San Francisco. 958pp.

Department of Microbiology

Semester I - 123-DSCC-01T-General Microbiology (NEP)

Course Title	General Microbiology	CIA Marks	40
Course Code	123-DSCC-01-T	SEE Marks	60
Scheme L:T:P)	4:0:0	Credits	4
Teaching hours	56	Examination Hours	3

Course objectives: This course (123-DSCC-01T) will enable the students to

1. To learn scope of microbiology and role of microorganism,
2. To learn Historical developments in microbiology.
3. To learn the skill of operating microscope for the observation of microbes.
4. Learn skills of Staining, sterilization ,preservation and culturing of microorganisms
5. To learn types of micro organisms , viral particles and their characteristics.
6. To learn taxonomy of Microbes, Methods of their classification.

Course Outcome: After successfully completion of the course, student are able to;

123-DSCC-01-T.1- Explain the branches, scope and History of Microbiology

123-DSCC-01-T.2- Operate different types of Microscopes, their constructions and working principal.

123-DSCC-01-T.3- Demonstrate different Staining techniques, sterilization techniques and preservation of microbes

123-DSCC-01-T.4- Illustrate different types of prokaryotes, Eukaryotes and Obligate intracellular parasites.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-DSCC-01-T.1	1	1		3	1	3					3	3	3	1	1
123-DSCC-01-T.2	3	3	1	3	1	3				3	3	3	3	3	3
123-DSCC-01-T.3	3	3	1	3	1	3				3	3	3	3	3	3
123-DSCC-01-T.4	3	3	1	3		3				3	3	3	3	3	3

Course Content :

Unit – 1: Historical development, major contributions, origin of microorganisms and microscopy **14 Hours**

History:

Historical development of microbiology -Theory of spontaneous generation, Biogenesis and Abiogenesis. Contributions of Anton Von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Edward Jenner, Alexander Fleming, Martinus Beijirinic, Segei Winogrodsky, Elei Metechnikoff. Contributions of Indian scientists in the field of Microbiology. Fossil evidences of microorganisms. Origin of life, primitive cells and evolution of microorganisms. Microcopy- working principle, construction and operation of simple and compound microscopes.

Taxonomy

Haeckel's Three Kingdom system, Whittaker's Five kingdoms classifications -Monera. Protista, Fungi, Plantae and Animalia. Principles and methods of classification. Different trends in classification of microorganisms

Chapter No. 3: Microscopy

Principles of Microscopy – Optical, Charge particle and Scanning probe microscope, Resolving power, Numerical Aperture, Working distance magnification and. Chromatic aberrations. Different types of Microscopes – Compound, Dark field, Stereo / Binoccular microscopes, Inverted microscope, Phase contrast, Fluorescent microscope, Electron microscope - Scanning and Transmission electron microscope

Unit – 2: Staining, sterilization and preservation of microorganisms 14 Hours

Staining : Nature of strains, principles, mechanism, methods and types of staining- Simple, Differential-Gram staining, Acid fast staining, staining of capsule, cell wall, endospore, inclusion bodies.

Sterilization : Principles, types and techniques, Physical, chemical, radiation and mechanical Preservation of microorganisms: Methods of preservation of microorganism, slant culture, stab culture, soil culture mineral oil overlaying, glycerol preservation.

Cultivation of Bacteria : a) Culture Media-Synthetic and non-synthetic-solid, liquid and semi-solid media, Special media-Enriched, Selective, transport, differential, enrichment media. b) Cultivation of aerobic and anaerobic bacteria. c) Pure culture Techniques- Serial dilution, pour plate, spread plate, streak plate. Colony characteristics. d) Maintenance and preservation of pure cultures

Unit–3: Types, structure, organisation and reproduction of prokaryotic microorganisms: 14 Hours

Overview of Prokaryotic Cell Structure : Size, shape, arrangement. Diagram of Prokaryotic cell organisation, cell wall structure and Gram staining, cell membrane; Bacterial and Archaeal, Cytoplasmic matrix- Cytoskeleton, ribosome, inclusion granules: Composition and function. Nuclear Materials – Bacterial chromosomes structure (its differences with the Eukaryotic chromosome); Extra Chromosomal materials. Components external to cell wall- capsule, slime, s-layer, pilli, fimbriae, flagella; structure, motility, chemotaxis. Bacterial Endospore - Examples of spore forming organisms, habitats, function, formation and germination.

Reproduction in bacteria and bacterial cell cycle.

Viruses : General characteristics of viruses. Concept of viroids, Satellite viruses,

Bacteriophages, virusoids, virions and Prions. Structure and Importance of viruses

Unit–4: Types, structure, organisation and reproduction of eukaryotic Microorganisms 14 Hours

Over view of eukaryotic cell structure : General structure and types of cells; External cell coverings and cell membrane. Structure and function of Cytoplasmic matrix- cytoskeleton: Structure and function; single Membrane organelles- Endoplasmic reticulum, Golgi complex, Lysosomos, Vesicles and Ribosomes; Double Membrane organelles- Nucleus, Mitochondrion and Chloroplast: Structure and Functions; Peroxisomes; Organelles of motility- Structure and movement of flagella and cilia.

Study of major groups of microorganisms

History and scope of Mycology, General Characteristics, Classification, Reproduction and significance of.

Fungi, Algae, Protozoa, Chylamydia, Rickettsia, Mycoplamsa

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
1	Historical development, major contributions, origin of microorganisms and microscopy	14	30	2	2	2	30
2	Staining, sterilization and preservation of microorganisms	14	30	2	2	2	30
3	Types, structure, organisation and reproduction of prokaryotic microorganisms:	14	30	2	2	2	30
4	Types, structure, organisation and reproduction of eukaryotic						
	Microorganisms	14	30	2	2	2	30
	Total	**56**	**120**	**08**	**08**	**08**	**120**

Semester End Theory Question paper pattern **Total Marks =60**

Q.I Answer the following (a,b,c) 2,5,8=15

OR

Q.II Answer the following (a,b,c) 2,5,8=15

Q.III Answer the following (a,b,c) 2,5,8=15

OR

Q.IV Answer the following (a,b,c) 2,5,8=15

Q.V Answer the following (a,b,c) 2,5,8=15

OR

Q.VI Answer the following (a,b,c) 2,5,8=15

Q.VII Answer the following (a,b,c) 2,5,8=15

OR

Q.VIII Answer the following (a,b,c) 2,5,8=15

Reference Book :

1. Prescott, Harley, Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill.
3. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd.
4. Brock Biology of Microorganisms, M. T. Madigan, J. M. Martinko, P. V. Dunlap, D. P. Clark-12th edition, Pearson International edition 2009, Pearson Benjamin Cummings.
5. Microbiology – An Introduction, G. J.Tortora, B. R.Funke, C. L. Case, 10th ed. 2008, Pearson Education.
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7. Microbiology- Concepts and Applications, Pelczar Jr,Chan, Krieg, International ed, McGraw Hill.
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13. Toratora, G. J., Funke, B. R. and Case, C.L. 2007. Microbiology 9th ed. Pearson Education Pte. Ltd., San Francisco. 958pp.

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Semester I- 123-DSCC-01P-General Microbiology (NEP)

Course Title	General Microbiology	CIA Marks	20
Course Code	123-DSCC-01-P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	32	Examination Hours	3

Course objectives: This course (123-DSCC-01P) will enable the students to

1. Understand the safety measures to be followed in Microbiology laboratory.
2. Learn aseptic conditions maintained during conduct of experiments.
3. Learn the handling and proper utilizing the laboratory equipment.
4. Perform the basic techniques of observation of microbes.

Course Outcome: After successfully completion of the course, student are able to;

123-DSC-01-P.1- Explain the safety and aseptic conditions maintained in the laboratory
123-DSC-01-P.2- Demonstrate the working of basic laboratory equipment.
123-DSC-01-P.3- Illustrate the skillful techniques of observation and estimation.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-DSC-01-P.1	3	3	1	3	1	3				3	3	3	3	3	3
123-DSC-01-P.2	3	3	1	3	1	3				3	3	3	3	3	3
123-DSC-01-P.3	3	3	3	3	1	3				3	3	3	3	3	3

Course Content :

1. Microbiological laboratory standards and safety protocols.
2. Standard aseptic conditions of Microbiological laboratory.
3. Operation and working principles of Light/ Compound microscope.
4. Working principles and operations of basic equipments of microbiological laboratory (Autoclave, Oven, Incubator, pH meter, Spectrophotometer, Colorimeter, vortex, magnetic stirrer etc).
5. Applications of basic microbiological tools (Pipettes, Micropipette, Bunsen burner, Inoculation loop, Spreader).
6. Demonstration and observations of microorganisms from natural sources under light microscope (Algae, Yeast and Protozoa).
7. Demonstration of bacterial motility by hanging drop method.
8. Bacterial Simple staining (Positive, Negative), fungi by Lactophenol cotton blue.
9. Differential staining - Gram staining, Acid fast staining.
10. Structural staining – Flagella, endospore , Capsule and reserved food materials
11. Measurement of microbial cells by-Micrometry.

Teaching Pedagogy:

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

Semester End Practical paper pattern **Total Marks =40**

Q.I	Major Question	15
Q.II	Minor I question	10
Q.III	Minor II question /Scheme writing/Spotting	05
Q.IV	Viva Voce	05
Q.V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

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Semester I- 123-OEC-01T -Microbial Technology for Human Welfare

Course Title	Microbial Technology for Human Welfare	CIA Marks	40
Course Code	123-OEC-01-T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	3

Course objectives: This course (123-OEC-01T) will enable the students to

1. Understand the importance of microbes in developing food products.
2. Learn how food can be used as medicine against many diseases.
3. Learn the beneficial effects of fermented foods.
4. Know how microbial techniques can be useful in agriculture.

Understand the microbial technology in pharmaceutical industries

Course Outcome: After successfully completion of the course, student are able to;

123-OEC-01-T.1- Explain the types and advantages of fermented food products

123-OEC-01-T. 2- Differentiate the process and benefits of alcoholic and non alcoholic beverages

123-OEC-01-T.3- Illustrate the application of microbes in agriculture

123-OEC-01-T.4- Demonstrated the Microbial Technology in Pharmaceutical Industry

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-OEC-01-T.1	1	3	3	3	1	3		3		3			3	3	3
123-OEC-01-T.2	1	3	3	3	1	3		3		3			3	3	3
123-OEC-01-T.3	1	3	3	3	1	3		3		3			3	3	3
123-OEC-01-T.4	1	3	3	3	1	3		3		3			3	3	3

Course Content :

Unit – I: Food and Fermentation Microbial Technology **14 Hours**

Fermented Foods – Types, Nutritional Values, Advantages and Health Benefits

Prebiotics, Probiotics, Synbiotics and Nutraceutical Foods

Fermented Products – Alcoholic and nonalcoholic beverages, fermented dairy products, Fruit fermented drinks.

Unit – II: Agriculture Microbial Technology **14 Hours**

Microbial Fertilizers, Microbial Pesticides, Mushroom Cultivation, Biogas Production

Unit – III: Pharmaceutical Microbial Technology **14 Hours**

Microbial Drugs – Types and Development of Drug Resistance

Antibiotics – Types, Functions and Antibiotic Therapy

Vaccines – Types, Properties, Functions and Schedules

Teaching Pedagogy :

Chalk and talk, Power point Presentation, etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
1	Food and Fermentation Microbial Technology	14	40	3	2	3	40
2	Agriculture Microbial Technology 14	40	2	4	2	40	
3	Pharmaceutical Microbial Technology 14	40	3	2	3	40	
	Total	**42**	**120**	**08**	**08**	**08**	**120**

Semester End Theory Question paper pattern **Total Marks =60**

Q.I Answer the following (a,b,c) 2,5,8=15

OR

Q.II Answer the following (a,b,c) 2,5,8=15

Q.III Answer the following (a,b,c) 2,5,8=15

OR

Q.IV Answer the following (a,b,c) 2,5,8=15

Q.V Answer the following (a,b,c) 2,5,8=15

OR

Q.VI Answer the following (a,b,c) 2,5,8=15

Q.VII Answer the following (a,b,c) 2,5,8=15

OR

Q.VIII Answer the following (a,b,c) 2,5,8=15

Reference Book :

1. Prescott, Harley, Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill.
3. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd.
4. Brock Biology of Microorganisms, M. T. Madigan, J. M. Martinko, P. V. Dunlap, D. P. Clark-12th edition, Pearson International edition 2009, Pearson Benjamin Cummings.
5. Microbiology – An Introduction, G. J. Tortora, B. R. Funke, C. L. Case, 10th ed. 2008,Pearson Education.
6. General Microbiology, Stanier, Ingraham et al, 4th and 5th edition 1987, Macmillan education limited.
7. Microbiology- Concepts and Applications, Pelczar Jr, Chan, Krieg, International ed, McGraw Hill.
8. Alexopoulos, C. J., Mims, C. W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp.
9. Atlas, R.M. 1984. Basic and practical microbiology. Mac Millan Publishers, USA. 987pp.
10. Black, J. G. 2008. Microbiology principles and explorations. 7edn. John Wiley and Sons Inc., New Jersey 846 pp.
11. Pommerville, J. C. Alcamo's Fundamentals of Microbiology. Jones and Bartlett Pub. Sudburry, 835 pp.
12. Schlegel, H. G. 1995. General Microbiology. Cambridge University Press, Cambridge, 655 pp.
13. Toratora, G.J., Funke, B. R. and Case, C.L. 2007. Microbiology 9th ed. Pearson Education Pte. Ltd., San Francisco. 958pp.

Department of Microbiology

Semester I - 123-SBC-01P -Microbiological Methods and Analytical Techniques

Course Title	Microbiological Methods and Analytical Techniques	CIA Marks	20
Course Code	123-SBC-01-P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	30	Examination Hours	3

Course objectives : This course (123-SBC-01P) will enable the students to

1. Learn the use of computer for the representation of scientific data.
2. Develop microbiological skills used in the laboratory for the cultivation, identification, observation and preservation of microbes.
3. Learn to operate the analytical instruments regularly used in the microbiological laboratories.

Course Outcome : After successfully completion of the course, students are able to;

123-SBC-01-P.1- Demonstrate professional skills at work
123-SBC-01-P.2- Compute digital skills for scientific representations
123-SBC-01-P.3- Illustrate the basic technical and analytical skills required in the microbiological laboratory

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-SBC-01-P.1	3	3		3	3	3				3			3	3	3
123-SBC-01-P.2	3	3		3	3	3				3			3	3	3
123-SBC-01-P.3	3	3		3	3	3				3			3	3	3

Course Content :

Unit: 1. Digital skills: **10 Hours**

- Use Drive to Organize files.
- Microsoft Office
- Microsoft's Word, Excel and PowerPoint are essential processing tools for virtually any profession. Creating presentations and spreadsheets
- Resume writing, Digital Poster making
- Image Editing and Graphical representation of data
- Google form

Document Formatting and converting files (JPEG, Word, PDF, Tiff, PPT)

UNIT: 2. Microbiological Skills **14 Hours**

Isolation and cultivation of microorganisms: Collection of samples, processing of samples, serial dilution, technique, inoculation of samples, incubation and observations of microbial colonies. Morphological characterization of microorganisms - Colony characteristics, Microscopic characters,

biochemical/physiological tests or properties and identification. Subculturing of microorganisms and pure culture techniques. Preservation of microorganisms.

Culturing of microorganisms

Types of culture media. Methods of isolation of bacteria and fungi - serial dilution, pour plate, spread plate and streak plate techniques.Cultivation of Anaerobic bacteria. Maintenance of Pure Cultures, Culture Collection Centres

UNIT: 3. Analytical Skills **6 Hours**

Centrifugation, Chromatography and Spectroscopy : Principles, Types, Instrumentation, Operation and applications.

Blue Print :

Sl.No	**Particulars**	**Marks**
1.	Experimental Skills	08
2.	Digital Skills	05
3.	Principle/Introduction/Mechanism	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05
Semester End Practical paper pattern		**Total Marks =40**
Q.I	Major Question	15
Q.II	Minor I question	10
Q.III	Minor II question /Scheme writing/Spotting	05
Q.IV	Viva Voce	05
Q.V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

Department of Microbiology

Semester II - 123-DSC-02T-Microbial Biochemistry and Physiology

Course Title	Microbial Biochemistry and Physiology	CIA Marks	40
Course Code	123-DSC-02-T	SEE Marks	60
Scheme (L:T:P)	4:0:0	Credits	4
Teaching Hours	56	Examination Hours	3

Course objectives : This course (123-DSC-02T) will enable the students to

1. Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
2. Understand the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis

Course Outcome : After successfully completion of the course, student are able to;

123-DSC-02-T.1- Describe the properties of bonds in the formation of molecule.
123-DSC-02-T.2- Explain the structure of and classification of biomolecules.
123-DSC-02-T.3- Describe microbial growth and factors affecting during culturing invitro.
123-DSC-02-T.4- Differentiating concepts of aerobic and anaerobic respiration metabolic pathways and concept of bioenergetics.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-DSC-02-T 1	3	3	3	3	3	3				3	3	3	3	3	3
123-DSC-02-T 2	3	3	3	3	3	3				3	3	3	3	3	3
123-DSC-02-T 3	3	3	3	3	3	3				3	3	3	3	3	3
123-DSC-02-T 4	3	3	3	3	3	3				3	3	3	3	3	3

Course Content :

Unit – I: Biochemical Concepts **14 Hours**

Basic Biochemical Concepts : Major elements of life and their primary characteristics, atomic bonds and molecules – bonding properties of carbon, chemical bonds- covalent and non covalent, Hydrogen bonds and Vander Waal Forces.

Biological Solvents : Structure and properties of water molecule, Water as an universal solvent, polarity, hydrophilic and hydrophobic interactions, properties of water, Acids, bases, electrolytes, hydrogen ion concentration, pH, buffers and physiological buffer system, Handerson – Hasselbatch equation.

Unit – II: Macromolecules – Types, Structure and Properties **14 Hours**

Carbohydrates : Definition, classification, structure and properties.

Amino acids and proteins : Definition, structure, classification and properties of amino acids, Structure and classification of proteins.

Lipids and Fats : Definition, classification, structure, properties and importance of lipids.

Porphyrins and Vitamins : Definition, structure, properties and importance of chlorophyll, cytochrome and hemoglobin.

Unit –III: Microbial Physiology **14 Hours**

Microbial Growth : Definition of growth, Mathematical expression, Growth curve, phases of growth, calculation of generation time and specific growth rate. Synchronous growth, Continuous growth (chemostat and turbidostat), Diauxic growth. Measurement of Growth: Direct Microscopic count - Haemocytometer; Viable count, Membrane filtration; Electronic Counting; Measurement of cell mass;Turbidity measurements-Nephelometer and spectrophotometer techniques; Measurements of cell constituents. Growth Yield (definition of terms). Influence of environmental factors on growth. Microbial growth in natural environments. viable non-culturable organisms. Quorum sensing.

Microbial Nutrition : Microbial nutrients, Classification of organisms based on carbon source, energy source and electron source, Macro and micronutrients.

Membrane Transport : Structure and organization of biological membranes, Types of Cellular transport, Passive, Facilitated, Active, Group Translocation, Membrane bound and binding protein transport system, Carrier models, Liposomes, Ion transduction Na K+, ATPase.

Unit – IV: Microbial Physiology- Bioenergetics, Microbial Respiration, Microbial Photosynthesis **14 Hours**

Bioenergetics : Free energy, Enthalpy, Entropy, Classification of high energy compounds, Oxidation reduction reactions, equilibrium constant, Redox potential, Law of thermodynamics.

Microbial Respiration:Respiratory electron transport chain in bacteria, oxidation – reduction reactions, protein translocation, oxidative and substrate level phosphorylation – inhibitors and mechanism, chemiosmotic coupling. Fermentation reactions (homo and hetero)

Microbial Photosynthesis : Light reaction:Light harvesting pigments Photophosphorylation, **CO2 fixation pathways :** Calvin cycle, CODH pathway, Reductive TCA pathway.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
1	Biochemical Concepts	14	30	2	2	2	30
2	Macromolecules – Types, Structure and Properties	14	30	2	2	2	30
3	Types, structure, Microbial Physiology	14	30	2	2	2	30
4	Microbial Physiology- Bioenergetics, Microbial Respiration, Microbial Photosynthesis	14	30	2	2	2	30
	Total	**56**	**120**	**08**	**08**	**08**	**120**

	Semester End Theory Question paper pattern	Total Marks =60
Q.I	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.II	Answer the following (a,b,c)	2,5,8=20
Q.III	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.IV	Answer the following (a,b,c)	2,5,8=20
Q.V	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.VI	Answer the following (a,b,c)	2,5,8=20
Q.VII	Answer the following (a,b,c)	2,5,8=20
	OR	
Q.VIII	Answer the following (a,b,c)	2,5,8=20

References :

1. Lehninger, et al. 1997 Principles of Biochemistry, CBS publishers, Mathews and Wan Horde.
2. Boyer Rodney 1999 - Concepts of Biochemistry, Pacific Grove, Brooks / Cole publishingCompany.
3. JainJ. L. - Fundamentals of Biochemistry, S. Chand and Company.
4. Atlas R. M. Microbiology –Fundamentalsand Application Mac Millian Publishing Company NewYork.
5. Edward AlcamoT. 1997 - Fundamental of Microbiology – 5th Edn., Adlison Wesley Longman Inc, New York.
6. Peleczar, M. J., ChanE. C. S. and Krieg, N. R.– 1982 Microbiology? Tata McGraw Hill Book Co. New York.
7. Prescott. Lansing, M., Harley John Pand Klein Donald, A Microbiology? WCB.
8. Stainer, R. Y. Ingraham J. L. - General Microbiology, Prentice Hall of India Pvt. Ltd., NewDelhi.
9. Sullia S. Band Shantaram, S. 1998 General Microbiology Oxford and IBH Publishing Co Pvt. Ltd. NewDelhi.

Department of Microbiology

Semester II - 123-DSC-02P-Microbial Biochemistry and Physiology

Course Title	Microbial Biochemistry and Physiology	CIA Marks	20
Course Code	123-DSC-02-P	SEE Marks	30
Scheme (L:T:P)	0:0:4	Credits	2
Teaching Hours	30	Examination Hours	3

Course objectives : This course (123-DSC-02P) will enable the students to

1. Learn the Preparation of chemicals, solutions, buffers required for the performance of practicals.
2. Learn the techniques of estimations of molecules.
3. Understand the factors affecting microbial growth and estimate in laboratory.

Course Outcome: After successfully completion of the course, student are able to;

123-DSC-02-P.1- Calculate and prepare the required solutions, chemicals and buffers for the experiment.

123-DSC-02-P.2- Demonstrate the procedure for the qualitative and quantitative estimation of molecules.

123-DSC-02-P.3- Design an experimental set up to demonstrate the effect of physical factors on microbial growth.

123-DSC-02-P.4- Demonstration of aerobic and anaerobic respiration in microbes

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-DSC-02-P.1	3	3	3	3	3	3				3			3	3	3
123-DSC-02-P.2-	3	3	3	3	3	3				3			3	3	3
123-DSC-02-P.3	3	3	3	3	3	3				3			3	3	3
123-DSC-02-P.4	3	3	3	3	3	3				3			3	3	3

Course Content :

1. Preparation of Solution: Normal and Molar solutions
2. Calibration of pH meter and determination of pH of natural samples
3. Preparation of Buffer Solutions
4. Qualitative determination and identification of Carbohydrates
5. Qualitative determination and identification of Proteins
6. Qualitative determination and identification of Amino Acids
7. Qualitative determination and identification of Fatty Acids
8. Quantitative estimation of Reducing Sugar by DNS method
9. Quantitative estimation of Proteins by Biuret and Lowry's method
10. Determination of lipid saponification values of fats and iodine number of fatty acids
11. Determination of bacterial growth by spectrophotometric method & calculation of generation time

12. Effect of pH, temperature and Salt concentration on bacterial growth
13. Effect of Salt concentration on bacterial growth
14. Effect of Temperature on bacterial growth
15. Demonstration of aerobic and anaerobic respiration in microbes

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Observation table/Calculations/Graph	06
3.	Principle/Introduction/Mechanism	04
4.	Result	02
5.	Viva voce	05
6.	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology, Plant pathology and Biotechnology- 4th Edition.
4. Dr. S. Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S. Sadasivam A. Manickam, Biochemical Methods

Department of Microbiology

Semester II- 123-OEC-02T - Environmental and Sanitary Microbiology

Course Title	Environmental and Sanitary Microbiology	CIA Marks	40
Course Code	123-OEC-02-T	SEE Marks	60
Scheme (L:T:P)	3:0:0	Credits	3
Teaching Hours	42	Examination Hours	3

Course objectives : This course (123-OEC-02T) will enable the students to

1. Learn habitats of microbes and their beneficial effects in soil.
2. Understand the distribution of microbes in different waterbodies.
3. Know how microbial infections spread through air, water and food and detection and control of these diseases

Course Outcome : After successfully completion of the course, student are able to;

123-OEC-02-T.1- Describe the distribution of microbes in environment and their beneficial and harmful effects.
123-OEC-02-T.2- Analyse the quality of drinking water.
123-OEC-02-T.3- Apply the knowledge of microbial infection on Public health hygiene.

Mapping of CO with PO and PSO :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1 (CBT)	2 (BBT)	3 (ZBT)
123-OEC-02-T.1	3	3	3	3	3	3	3	3		3			3	3	3
123-OEC-02-T.2	3	3	3	3	3	3	3	3		3			3	3	3
123-OEC-02-T.3	3	3	3	3	3	3	3	3		3			3	3	3

Course Content :

Unit – 1: Soil and Air Microbiology **14 Hours**

Soil and Air as a major component of environment. Types, properties and uses of soil and air.Distribution of microorganisms in soil and air.Major types of beneficial microorganisms in soil.Major types of harmful microorganisms in soil

Unit – 2: Water Microbiology **14 Hours**

Water as a major component of environment. Types, properties and uses of water.

Microorganisms of different water bodies.Standard qualities of drinking water

Unit – 3: Sanitary Microbiology **14 Hours**

Public health hygiene and communicable diseases. Survey and surveillance of microbial infections. Airborne microbial infections, waterborne microbial infections,Food borne microbial infections. Epidemiology of microbial infections, their detection and control.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 marks	8 marks	Total marks
1	Soil and Air Microbiology	14	40	3	2	3	40
2	Water Microbiology	14	40	2	4	2	40
3	Sanitary Microbiology	14	40	3	2	3	40
	Total	**42**	**120**	**08**	**08**	**08**	**120**

Semester End Theory Question paper pattern **Total Marks =60**

Q.I Answer the following (a,b,c) 2,5,8=15

OR

Q.II Answer the following (a,b,c) 2,5,8=15

Q.III Answer the following (a,b,c) 2,5,8=15

OR

Q.IV Answer the following (a,b,c) 2,5,8=15

Q.V Answer the following (a,b,c) 2,5,8=15

OR

Q.VI Answer the following (a,b,c) 2,5,8=15

Q.VII Answer the following (a,b,c) 2,5,8=15

OR

Q.VIII Answer the following (a,b,c) 2,5,8=15

Reference Book :

1. Prescott, Harley, Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill.
3. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd.
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8. Alexopoulos, C. J., Mims, C. W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp.
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11. Pommerville, J. C. Alcamo's Fundamentals of Microbiology. Jones and Bartlett Pub. Sudburry, 835 pp.
12. Schlegel, H. G. 1995.General Microbiology. Cambridge University Press, Cambridge, 655 pp.
13. Toratora, G. J., Funke, B. R. and Case, C. L. 2007. Microbiology 9th ed. Pearson Education Pte. Ltd., San Francisco. 958pp.

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STUDENTS' HAND BOOK

FOR
B.Sc. III & IV SEMESTER

2022-23

Name : _____

Class : _____ Division : _____ Reg No. : _____

STAFF LIST - 2022-23

PRINCIPAL

Dr. L. D. Horakeri, Associate Professor Physics & I/C Principal

DEPARTMENT OF PHYSICS

1 Shri S. V. Angadi Associate Prof.
2 Smt. L. C. Shidaganal Associate Prof.
3 Dr. Jagadeesha Angadi V. Assistant Prof.
4 Shri Veeresh G. Hiremath Assistant Prof.
5 Miss. Medha Deshpande Assistant Prof.
6 Dr. Rajesh Nairy K. Assistant Prof.
7 Dr. Veena E. Assistant Prof.
8 Smt. Sheela Gandhad, Lecturer

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3 Dr. Shivakumar S. Toragalmath Assistant Prof.
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6 Smt. Suma J. G. Assistant Prof.
7 Miss. Afra Quasar Nadaf Assistant Prof.
8 Shri Vinayak Chandrappa Barangi Assistant Prof.
9 Dr. (Smt). Padmeshewary R. Assistant Prof.
11 Shri Pavankumar H. Assistant Prof.
11 Miss. Roopali Chonchannavvar Lecturer

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3 Smt. Ashma F. Ganachari Assistant Prof.
4 Smt. Ganganmma Mokashi Lecturer
5 Smt. Vidya Pattanshetti Lecturer
6 Dr. Pallavi Mirajkar Lecturer
7 Miss. Pavitra Korishettar, Lecturer
8 Miss. Suvarna Jodatti, Lecturer

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2 Shri Dheerendra Vadhiraj Assistant Prof.
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4 Smt. Geeta Bindali Lecturer
5 Miss. Baby Benasamati Lecturer

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2 Smt. Sumangala B. Patil Assistant Prof.
3 Miss. Kiran V. Gargi Lecturer
4 Miss. Soumay Kundgol, Lecturer
5 Miss. Nisha Hosur Lecturer

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1 Dr. C. C. Math Associate Prof.
2 Shri B. Venkateshwar Lecturer
3 Miss. Shruti Hiremath Lecturer

DEPARTMENT OF ELECTRONICS

1 Shri R. P. Mudenurmath Lecturer
2 Shri M. S. Sethsanadi Lecturer
3 Smt. Revati Poonja Lecturer
4 Shri Naveenrudda H. Tiligal Lecturer

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1 Smt. Geetanjali Kamble Lecturer
2 Dr. Gurusiddesh Hiremath Lecturer
3 Smt. Aishwarya Y. Ladwa, Lecturer
4 Dr. Sneha Chinnata, Lecturer
5 Dr. Jayaraj Chinchali Lecturer
6 Smt. Shruti M. Hugar, Lecturer

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1 Shri Vikas Tuwar Lecturer
2 Miss. Deepa Sonar Lecturer

DEPARTMENT OF ENGLISH

1 Dr. M. Y. Molekar, HOD
2 Dr. G. G. Patil, Assistant Professor

DEPARTMENT OF KANNADA

1 Smt. Anasuya Y. T., HOD
2 Miss. M. S. Jayshree Lagammanavar Lecturer

DEPARTMENT OF HINDI

1 Shri. S. A. Patil HOD

DEPARTMENT OF LIBRARY

1 Smt. Vijayalaxmi A. Shivanigi Librarian

SPORTS

1 Shir Prabhakarna T. Assistant Professor

NON-TECHING STAF

1. Shri Shreedar Chegaraddi, FDA
2. Shri N. C. Itagi, Superintendent
3. Smt. Rajani S. Nayak, FDA
4. Shri B. N. Jamakandi, SDA
5. Shri Mahaveer N. Devalapur, SDA
6. Shri M. S. Hiremeth, Lab Asst.
7. Shri S. M. Hospeti, Lab Asst.

EXAMINATION SECTION

1. Dr. L. D. Horakeri Principal
2. Shri Dheerendra V. Vadiraj, Controller of Examition
3. Miss. Lata Ichageri, F.D.A.
4. Miss. Shilpa Kallimani, FDA

PLACEMENT OFFICER

1 Smt. Sneha Sapare

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CALENDAR OF EVENTS FOR THE YEAR 2022-23 FOR B.Sc. / BCA *II, IV, & VI* SEMESTERS

MONTHS	WEEKS	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	NO OF WORKING DAYS	EVENTS
APR/MAY	I	09	10	11	12	13	14	15	05	COLLEGE REOPEN ON 10TH APRIL 14/04/23 DR. Ambedkar Jayanti VI SEMESTER CLASSES COMMENCES
	II	16	17	18	19	20	21	22	05	22/04/23 Idul Fitar 17/04/2023, II & IV SEMESTER CLASSES COMMENCES
	III	23	24	25	26	27	28	29	06	
	IV	30	01	02	03	04	05	06	05	01/05/23 **Labor's Day Week of Parent- teacher Meet**
	V	07	08	09	10	11	12	13	06	Week of B.O.S Meetings.
MAY/JUN	VI	14	15	16	17	18	19	20	06	Display of attendance report Department wise
	VII	21	22	23	24	25	26	27	06	**C1-Week of First IA Test**
	VIII	28	29	30	31	01	02	03	06	
	IX	04	05	06	07	08	09	10	06	
	X	11	12	13	14	15	16	17	06	Display of attendance report Department wise
JUN/JULY	XI	18	19	20	21	22	23	24	06	**C2-Week of Surprise Test**
	XII	25	26	27	28	29	30	01	05	29/06/23 Bakarid BOAE / BOE Meeting Submission of Panel of Examiners.
	XIII	02	03	04	05	06	07	08	06	**Week of Makeup Test** **Order to Examiners to set the Question paper**
	XIV	09	10	11	12	13	14	15	06	**C3-Completion of IIIrd Component.** **WEEK OF INTERNAL PRACTICALS**
JUL/AUG	XV	16	17	18	19	20	21	22	06	Week of Display of SEE Time table Week of submission of Exam application
	XVI	23	24	25	6	27	28	29	05	29/07/23 Moharum SUBMISSION OF CIA MARKS
	XVII	30	31	01	02	03	04	05	06	Display of attendance report Department wise 5th AUG is the last working day
TOTAL NUMBER OF WORKING DAYS									97	

- *Conduct of Assignments/ Viva/Seminars etc is as per the respective Department Calendar of events.*
- *Vacation: From 06/08/2023 to 24/09/2023.*
- *Semester end Practical Examination 08/08/2023 on wards.*
- *Semester end Theory Examination from 01/09/2023.on wards.*
- *Declaration of results 28/09/2023.*
- *Reschedule of events if any emergency holidays.*
- *College reopens on 25/09/2023.*

Principal
K. L. E. Society's P. C. Jabin Science College
Vidyanagar, Hubballi.
Karnataka - 580031.

Academic Calender of Events
2022-23

DEPARTMENT	September	October	November	December	January	February
PHYSICS	1.Bridge course for 1st sem students	1.Capacity building program 2.Display of teaching plan and lesson plan 3. Value added / certificate course enrollment	1.Study visit 2. Gender equity program 3.1st IA .	1.Guest Lecture 2. Extension activity 3. Peer tutoring 4.Study visit 5. 2nd IA	1.College level competitions 2. Make up test	1.Guest Lecture 2. Online International seminar / Conference
MATHS		1.Display of Teaching plan & lesson plan 2.Value added/certificate course enrollment	1.Faculty exchange programme 2.BOS meeting 3.Guest lecture 4.Display of attendance 5.1st IA 6.Students seminar	1.Workshop on JAM/Gate 2.Display of attendance 3.BOE meeting 4. 2nd IA 5.Quiz strife - 3	1. Make up test 2.Display of attendance 3.Display of consolidated marks	1.Submission of CIA marks 2.Curriculum feedback & analysis
CHEMISTRY	Bridge Course for Sem -1	1. Bridge Course for Sem -1. 2. Orientation Program for Sem -1. 3.BOS Meeting. 4. Display of Teaching plan & Lesson Plan. 5.Value added / CertificateCourse enrollment 6. Coaching for JAM/PGCET/other competitive exams	1. Selection of association secretaries. 2. Inauguration of chemical society. 3. Guest Lecture. 4. Display of attendance 5. 1st IA	1. Program for advanced learners. 2. Program for slow learners. 3.Display of Attandence 4. BOE meeting 5. 2nd IA	1. Industrial visits/Field visits/ Survey. 2. Make-up test 3.Extension activities 4. Display of attendance 5. Practical IA 6. Display of consolidated marks.	1. Submission of CIA marks. 2. Curriculim feedback analysis. 3. FDP

ZOOLOGY	1.Ozone day awareness programme	1.World animal welfare week celebration 2.Display of teachingplan & lesson plan 3.Value added /certificate course enrolment 4.Faculty development programme	1.Faculty exchange program. 2.BOS meeting 3Faculty exchange progeam 3.Displayof attendance 4. 1st IA	1.National pollution preventation Day 2.Display of attendance 3.BOE meeting 4. 2nd IA	1. Makeup test 2.Display of attendance 3.Display of conosolidated marks	1.Submission of CIA marks 2.Curriculum feedback& analysis
BOTANY		1.Departmental activities. 2.World Food Day(competition on food) 3.BoS meeting	1.Guest Lecture 2.V sem industrial visit		1.Guest Lecture	1.Field visit for BSc 1st, Vth & V1 th sem students
STATISTICS		1.Induction/Orientation programme. 2. Display of Teaching plan & Lesson Plan. 3. Value added / Certificate Course enrollment. 4. FDP on curriculum development.	1. Seminar /Workshop 2. BOS meeting. 3. Display of attendance. 4. Industrial visits/Field visits 5. 1st IA	1. Capacity development/ Skill enhancement activity. 2. Student /Faculty Exchange programme. 3. Displayof attendance 4. BoE meeting 5. 2nd IA	1. Extension activity 2. Makeup test. 3. Seminar / Workshop. 4. Display of attendance 5. Display of consolidated marks.	1. Submission of CIA. 2. Curriculum feedback & analysis.
ELECTRONICS			1.Technical talk	1. Association activity 2. Industry visit for students. 3.Enrichment program	1.Value added course commencement	1. Association activity

COMP-SCIENCE	1. Workshop 2. Quiz competition	1. Paper presentation. 2. Department Extension activity	1. Seminar 2. FDP		1.Technical talkon upcoming technology like AI/ Machine learning/IoT/ Ghat GPT 2. Project Domain& report. 3. Workshop for BSC VI sem.	1. Guest Lecture 2. FDP
BIOTECHNOLOGY/ MICROBIOLOGY		1. Workshop. 2.Career guidance -18th Oct,2022	1.Food fest 2.Guest lecture – world Diabetes DAy -14th Nov,2022	1.Industrial visit		1.National Science Day -28th Feb,2023 2. Model Making
PLACEMENT	1. Employable aptitude training 2.SAP LAB & Wipro campus drive	1. Employable aptitude training / Industry academia Collaboration 2.SAP LAB campus drive 3. Wipro campus drive	1.Atos off campus drive 2.Mindtree campus drive 3.Accenture campus drive 4.TCS campus drive	1.TCS campus drive	1.Nestle campus drive 2.Hexaware campus drive	
LIBRARY	1. Library Orientation Programme. 2.Conducting orientation on e-resources to PG students	1.Inviting an author from local area. 2.Enhancing reading skills among students	Talk on Competitive Exam. Talk on our Library E-resources	Talk on Collection of E-resources	Guest Lecture	----------
KANNADA	Guest Lecture for students	Organising various competitions for students	Organising various guest lectures for students	Organizing field visits for students	----------	----------
ENGLISH		1.BoS meeting 2.Display of	1.Inaugraution of Department Association	1.Capacity Development program	1.Intercollege competition for	1. Submission of CIA marks.

		teaching plan & lesson plan 3. Value added/ certificate course enrolment	Activities 2. Guest Lecture 3.Program on Gender equality and Women empowerment . 4.Display of attendance 5 .1st IA	2.Competition for students 3. 3.Display of attendance 4. 2nd IA 5. FDP	students 2.Make –up test 3. Display of attendance 4.Workshop 5. Display of consolidated marks	2.Curriculum feedback and analysis.
HINDI		1.BoS meeting 2.Display of teaching plan & lesson plan	1.Inaugrautionof Department Association Activities 2.Display of attendance 3.1st IA	1.Guest Lecture 2.Competition for students 3.Display of attendance 2. 2nd IA	1. Make-up test 2. Display of attendance 3. Display of consolidated marks	1.Submission of CIA marks 2.Curriculum feedback and analysis.

Department	**March**	**April**	**May**	**June**	**July**	**August**
Physics		1. Capabilty building program 2.Online National Seminar 3.Study visit 4. Organization of seminar	1. College level competitions 2. 1st IA 3.Guest lecture 4.Peer tutoring 5. FDP on curricular design 6. Outreach program	1. 2nd IA 2.Guest Lecture 3. Online National level seminar 4. Makeup test	1. Quiz competitions .	.
Maths	1.Submission of documents to IQAC	1.BOS Meeting 2.Poster presentation	1.Display of attendance 2.1st IA 3.Math exhibition	1.Display of attendance 2.BOE meeting 3.2nd IA	1.Guest lecture 2.Display of consolidated marks 3.Submission of CIA	1.Submission of documents to IQAC

			4.Faculty exchange programme	4.Makeup test	marks 4.Curriculum feedback &analysis 5.Natonal conference	
Chemistry	1.Submission of documents to IQAC 2. BOS meeting	1. Departmental competitions. 2.State level conference	1. Display of attendance 2. 1st IA 3.Programme for advanced learners Programme for slow learners	1.Display of attendance 2.BOE meeting 3. 2nd IA 4.Industry visit/field visit/survey 5.Makeup test Coaching for JAM/PGCET/other competitive examination	1.Extension activities 2. Practical IA 2.Display of consolidated marks 3.Submission of CIA marks 4.validctoryof chemical society 5.Workshop for students 6.curiiculum feedback & analysis	1. FDP 2.Submission of documents to IQAC
Zoology	1.Submission of CIA marks	1.World Health day 2.Natonal seminar 3.Faculty development program 4. BoS meeting	1.Display of attendance 2.1st IA	1.Dispaly of attendance 2.BoS meeting 3.World food safety day 4. 2nd IA 5. Makeup test	1.Diaplay of consoidated marks 2.Submission of CIA Marks. 3. Curriculum feedback & analysis	1.Submission of documents to IQAC
Botany	1.SEE	1.Project assignment	1. Association activity. 2.Mini project assignment	1.Guest Lecture	1. Article writing competition	1. Project exhibition 2.FDP 3.SEE
Electronics	Project /Mini project assignment	Industry visit for Final year students	Exhibition	Lab demonstration to junior students to senior students	1.) Guest lecture. 2.)Association activities	Seminar/conference /Workshop /FDP
Computer Science	1. Hands on training on Android apps Development					
BIOTECHNOLOGY/ MICROBIOLOGY	1.Workshop related to career guidance	1. Workshop on – Laboratory safety and waste management	1.World Biological Diversity DAy – 22 May 2023 –	1.27th June, Celebration of the Microbial		

			Photography competition	world - competition		
PLACEMENT	1.L & T campus drive 2.Federal Bank campus drive 3.E & Y	1.Soft skill training 2.TCS Campus BPS drive/Employable 3.Q Spider campus drive	1.Seminar on how to face UPSE 2.Shilpa medicare campus drive/Employable aptitude training 3.Guest Lecture/ employabelaptitude training 4.Workshop on grooming	1. HCL Campus drive/ Employable aptitude training 2.IBM Campus drive 3.Global Foundaries campus drive/ Employable aptitude training 4. BYJUS campus drive		
Library	Celebrating world book day.	Guest Lecture on NLIST	Book Exhibition on Environmental Day.	Workshop on DEINET & NLIST resources.	Celebration of Library week & Guest Lecture.	Seminar on Plagirasim
Kannada	Organising various competitions for students	Organising various guest lectures for students	Organizing field visits students	Conducting skill development programmes	Organising FDP programmes for faculties and students	
English	1.Submission of documents to IQAC 2.Extension activity	1. Program on Gender equality and Women empowerment . 2. BoS meeting 3.Celebration of English language Day	1.Display of attendance 2. 1st IA 3. Capacity development program 4. Guest lecture	1.Display of attendance 2. BoE meeting 3. 2nd IA 4. FDP Competition for students 5. Make up test	1.Extension Activities 2.Displayof consolidated marks 3.Submission of CIA Marks 4.Ciriculumfeedback & Analysis Seminar/Seminar competition	1. Workshop 2. Submission of documents to IQAC 3. Conference
Hindi	1.Submission of documents to IQAC	1.Value added/ certificate course enrolment 2. BoS meeting	1.Display of attendance 2. 1st IA 3. Guest lecture	1.Display of attendance 2. BoE meeting 3. 2nd IA 4. Competition for students 5.Make-up test	1.Diaplay of consoidated marks 2. submission of CIA marks 3. Curriculum feedback & analysis	1.Submission of documents to IQAC

ಕನ್ನಡ ವಿಭಾಗ – 2022–23

III - ಸೆಮಿಸ್ಟರ್ NEP

L1–1–ಕನ್ನಡ ಭಾಷಾ ಪತ್ಯ–ವರದಾ–03

Course Code: 111KAN03T — CIA Marks :40
Teaching Hrs : 48 — CIA Marks :40
Scheme: 4:0:0 — Credits: 3

Course objectives: This course 111KAN03T will enable the students to

- ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ನಾಡು– ನುಡಿಯ ಸೇವೆಯು ಬದುಕಿನ ಅವಿಭಾಜ್ಯ ಅಂಗ ಎಂಬುದನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಾಹಿತ್ಯದ ಮೂಲಕ ಸದೃಢವಾದ ಬೌದ್ಧಿಕ ವ್ಯಕ್ತಿತ್ವವನ್ನು ಮೈಗೂಡಿಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಭಾಷಾ ಕೌಶಲ್ಯಗಳಲ್ಲಿ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೊಂದುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಮಕಾಲಿನ ವಿದ್ಯಮಾನಗಳ ಅರಿವನ್ನು ಮೂಡಿಸಿಕೊಳ್ಳುವರು.

Course Outcome: After successfully completion of the course, student are able to;

- 111KAN03T. 1.ಮಾನವೀಯ ಮೌಲ್ಯಗಳ ಕುರಿತು ತಿಳುವಳಿಕೆಯನ್ನು ವಿಸ್ತರಿಸುವುದು.
- 111KAN03T. 2.ವೈಚಾರಿಕ ಸಂಶೋಧನಾತ್ಮಕ ವಿಮರ್ಶಾತ್ಮಕ ದೃಷ್ಟಿಕೋನವನ್ನು ಬೆಳೆಸುವುದು.
- 111KAN03T. 3.ಸೃಜನಶೀಲತೆ ಅಭಿವ್ಯಕ್ತಿ ಸಾಮರ್ಥ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು.
- 111KAN03T. 4.ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಪರಿಸರದ ಬಗ್ಗೆ ಜಾಗೃತಿಯನ್ನು ಮೂಡಿಸುವುದು.

Mapping of CO with PO and PSO:

CO.	PO									
	1	2	3	4	5	6	7	8	9	10
111KAN03T.1						3				
111KAN03T.2						3				
111KAN03T.3						3				
111KAN03T.4						3				

ಘಟಕ–1 : ಮಾನವೀಯತೆ **14ಗಂಟೆ**

1. ಬಸವಣ್ಣನವರ ವಚನಗಳು
   1) ಕಳಬೇಡ––––– 2) ಏನಿಬಂದಿರಿ–––––––
   3) ದಯವಿಲ್ಲದಾ–––– 4) ಕಲ್ಲನಾಗರ ಕಂಡರೆ––––––
   5) ನೆಲವೊಂದೆ ಹೊಲಗೇರಿ
2. ಅಮೃತ ಬಳ್ಳಿಯ ಕಷಾಯ – ಜಯಂತ ಕಾಯ್ಕಿಣಿ
3. ಕುಲ ಕುಲ ಕುಲವೆಂದು ಹೊಡೆದಾಡದಿರಿ – ಕನಕದಾರು

ಘಟಕ–2 : ಪ್ರವಾಸ **14ಗಂಟೆ**

1. ಉತ್ಕಲ ವಂಗಾ – ಪ್ರವಾಸ ಕಥನ
2. ಬ್ರಿಟನ್ನಿನ ಮಲೆನಾಡು – ದಿನಕರ ದೇಸಾಯಿ
3. ಪೂರ್ವಾಂಗನೆ ಪಶ್ಚಿಮಾಂಗನೆ – ಡಾ ಸಿದ್ದಯ್ಯ ಪುರಾಣಿಕ

ಘಟಕ–3 : ವಿಚಾರ ಕ್ರಾಂತಿ **14ಗಂಟೆ**

1. ಮಳೆಗಾಗಿ ಯೋಗಿಯ ವ್ಯರ್ಥ ಪ್ರಾರ್ಥನೆ – ಡಾ. ಎಚ್. ನರಸಿಮಹಯ್ಯ
2. ಮಹಿಳೆ ಮತ್ತು ತತ್ವಪದ – ಮೀನಾಕ್ಷಿ ಬಾಳಿ
3. ಸಿಂಹನಾದಂಗೈದಂ – ರನ್ನ

ಘಟಕ–4 : ಸಂಕೀರ್ಣ **14ಗಂಟೆ**

1. ಟಾಲ್ಸ್ ಟಾಯ್ ಕಥೆಗಳು – ಲಿಯೋ ಟಾಲ್ಸ್ ಟಾಯ್
2. ಪರಿಸರ ನಿರ್ವಹಣೆ ಮತ್ತು ಮಹಿಳೆ – ಸತ್ಯಾ ಎಸ್.
3. ಪರಿಸರದ ಕಥೆ – ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ

Teaching Pedagogy:

ಮಾತು ಮತ್ತು ಬರವಣಿಗೆ (Chalk and talk,) ನಿಯೋಜಿತ ಕಾರ್ಯ,

Reference Book:

* ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1. ಬಸವಣ್ಣನವರ ವಚನಗಳು – ಎಲ್ ಬಸವರಾಜು
2. ತೆರೆದ ಮನ – ಡಾ. ಎಚ್. ನರಸಿಂಹಯ್ಯ
3. ಕವಿ ಚಕ್ರವರ್ತಿ ಕವಿ ರನ್ನವಿರಚಿತ ಸಾಹಸಭೀಮ ವಿಜಯಂ – ಆರ್. ವಿ.ಕುಲಕರ್ಣಿ
4. ಮಹಾ ಪ್ರಸ್ಥಾನ ಮತ್ತು ಇತರ ಕಥೆಗಳು – ಜಿ. ರಂಗನಾಥರಾವ್

UNIT	Name of the topics	Teaching hours	Marks per unit	2Marks	5Marks	10Marks	Total
1.	ಮಾನವೀಯತೆ	14	15	2	2	2	15
2.	ಪ್ರವಾಸ	14	15	2	2	2	15
3.	ವಿಚಾರ ಕ್ರಾಂತಿ	14	15	2	2	2	15
4.	ಸಂಕೀರ್ಣ	14	15	2	2	2	15
5.	ಒಟ್ಟು	42	60	4	4	4	60

ಕನ್ನಡ ವಿಭಾಗ
IV - ಸೆಮಿಸ್ಟರ್ NEP
L1–1–1–ಕನ್ನಡ ಭಾಷಾ ಪಠ್ಯವರದಾ–4

Course Code: 111KAN04T — CIA Marks :40
Teaching Hrs : 48 — CIA Marks :40
Scheme: 4:0:0 — Credits: 3

Course objectives: This course 111KAN04T will enable the students to

- ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ನಾಡು– ನುಡಿಯ ಸೇವೆಯು ಬದುಕಿನ ಅವಿಭಾಜ್ಯ ಅಂಗ ಎಂಬುದನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಾಹಿತ್ಯದ ಮೂಲಕ ಸದೃಢವಾದ ಬೌದ್ಧಿಕ ವ್ಯಕ್ತಿತ್ವವನ್ನು ಮೈಗೂಡಿಸಿಕೊಳ್ಳುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಭಾಷಾ ಕೌಶಲ್ಯಗಳಲ್ಲಿ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೊಂದುವರು.
- ವಿದ್ಯಾರ್ಥಿಗಳು ಸಮಕಾಲಿನ ವಿದ್ಯಮಾನಗಳ ಅರಿವನ್ನು ಮೂಡಿಸಿಕೊಳ್ಳುವರು.

Course Outcome: After successfully completion of the course, student are able to;

- 111KAN04T. 1. ಮಾನವೀಯ ಮೌಲ್ಯಗಳ ಕುರಿತು ತಿಳುವಳಿಕೆಯನ್ನು ವಿಸ್ತರಿಸುವುದು
- 111KAN04T. 2. ಧರ್ಮ ಸಹಿಷ್ಣುತೆಯ ಮನೋಭಾವನೆಯನ್ನು ವಿಸ್ತರಿಸುವುದು
- 111KAN04T. 3 ಸಮಕಾಲಿನ ವಿದ್ಯಮಾನಗಳ ಹಾಗೂ ಸಾಮಾಜಿಕ ಹೊಣೆಗಾರಿಕೆಯ ಅರಿವು.
- 111KAN04T. 4 ಕನ್ನಡದಲ್ಲಿ ತಾಂತ್ರಿಕ ಕೌಶಲ್ಯ ಹಾಗೂ ಉದ್ಯಮಶೀಲತೆಗಳ ತರಬೇತಿ

Mapping of CO with PO and PSO:

CO.	PO									
	1	2	3	4	5	6	7	8	9	10
111KAN04T.1						3				
111KAN04T.2						3				
111KAN04T.3						3				
111KAN04T.4						3				

ಘಟಕ–1 : ದಮನೀತ ಲೋಕ **14ಗಂಟೆ**

1. ಕರಿಸಿದ್ದ – ಕುವೆಂಪು
2. ನಿಮ್ಮೊಡನಿದ್ದೂ ನಿಮ್ಮಂತಾಗದೆ – ಕೆ.ಎಸ್. ನಿಸಾರ ಅಹ್ಮದ
3. ಹಸಿದವರು (ಕವಿತೆ) – ಡಾ. ನಿಜಲಿಂಗಪ್ಪ ಮಟ್ಟಿಹಾಳ

ಘಟಕ–2 : ಸಹಿಷ್ಣುತೆ **14ಗಂಟೆ**

1. ಸಂತ ಶಿಶುನಾಳ ಶರಿಫರ ತತ್ವಪದ
2. ಕನ್ನಡದ ಬೀಜಮಂತ್ರ – ಕೆ. ವಿ. ಸುಬ್ಬಣ್ಣ
3. ಸಮನ್ವಯ ಸಂಸ್ಕೃತಿ – ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ

ಘಟಕ–3 : ಶ್ರೀ ಸಾಮಾನ್ಯನ ಬದುಕು **14ಗಂಟೆ**

1. ಉತ್ತರಾದೇವಿ ಜನಪದ ಕಥನ ಕವನದ ಆಯ್ದ ಭಾಗ
2. ಮೊಸರಿನ ಮಂಗಮ್ಮ – ಮಾಸ್ತಿ ವೆಂಕಟೇಶ ಅಯ್ಯಂಗಾರ
3. ಅಕ್ಟೋಬರ 2 ರಂದು ಅಸಾಮಾನ್ಯ ಗಾಂಧೀ ಮಾರಾಜನಿಗೆ ಸಾಮಾನ್ಯ ಹೇಳಿದ್ದು ಚಂದ್ರಶೇಖರ ಪಾಟೀಲ

ಘಟಕ–4 : ಸಂಕಿರಣ **14ಗಂಟೆ**

1. ವಿಜ್ಞಾನ ಮತ್ತು ಧರ್ಮ – ಜಿ. ರಾಮಕೃಷ್ಣ
2. ಮೊಬೈಲ್ ಯುಗದಲ್ಲಿ ಮುನ್ನೆಚ್ಚರಿಕೆ
3. ಔಷಧಿಗಿಂತ ಪರಿಣಾಮಕಾರಿ ಜೀವನಶೈಲಿ ಬದಲಾವಣೆ – ಡಾ. ವಸುಂಧರಾ ಭೂಪತಿ

Teaching Pedagogy:

ಮಾತು ಮತ್ತು ಬರವಣಿಗೆ (Chalk and talk,) ನಿಯೋಜಿತ ಕಾರ್ಯ,

Reference Book:

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1. ಸಣ್ಣ ಕಥೆಗಳು – ಮಾಸ್ತಿ ವೆಂಕಟೇಶ ಅಯ್ಯಂಗಾರ
2. ಬರಕೊ ಪದ ಬರಕೊ – ತತ್ವಪದ
3. ಸಮನ್ವಯ ಸಂಸ್ಕೃತಿ – ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ
4. ಸಮಗ್ರ ಕವಿತೆಗಳು – ಕೆ ಎಸ್. ನಿಸಾರ ಅಹ್ಮದ

UNIT	Name of the topics	Teaching hours	Marks per unit	2Marks	5Marks	10Marks	Total
1.	ದಮನೀತ ಲೋಕ	14	15	2	2	2	15
2.	ಸಹಿಷ್ಣುತೆ	14	15	2	2	2	15
3.	ಶ್ರೀ ಸಾಮಾನ್ಯನ ಬದುಕು	14	15	2	2	2	15
4.	ಸಂಕಿರಣ	14	15	2	2	2	15
5.	**ಒಟ್ಟು**	**42**	**60**	**4**	**4**	**4**	**60**

DEPARTMENT OF ENGLISH
B.Sc. - III SEMESTER
ENGLISH TREASURE-1

Course Code: 113AECC3 **CIA Marks : 40**
Teaching Hrs : 52 **SEE Marks : 60**
Scheme : 4:0:0 **Credit : 03**

Course objectives: This course will enable the students to:

* To read and comprehend dramas and one act plays.
* To develop their overall pronunciation skills.
* To have basic insights into the sentence stress of English
* To enhance composition skills and strengthen their writing ability.
* To acquire the rules of English grammar to face competitive exams.
* To learn how to live in society without depending too much on anything

Course Outcome: After successful completion of the course, students are able to:

113AECC3.1 To comprehend dramas and one act plays to improve communication skills.
113AECC3.2 To develop their communication skills, presentation skills and professional ethics.
113AECC3.3 To comprehend and use proper pronunciation Skills with the help of phonetics.
113AECC3.4 To develop vocabulary and use functional grammar to face competitive exams.
113AECC3.5 To develop their overall personality by utilizing the qualities of creativity and social responsibilities, appreciate and be sensitized towards the prevailing environmental natural, physical, social, gender and cultural issues.

Mapping of CO with PO and PSO:

CO.	PO									
	1	2	3	4	5	6	7	8	9	10
113AECC3.1						3				
113AECC3.2				2		3			2	
113AECC3.3						3				
113AECC3.4						2				
113AECC3.5						2	2	2		

Course Content :

Unit I - Drama **20 Hrs**

As You Like It - Williams Shakespeare (Any Edition)

Unit II - One Act Play **08 hrs**

The Bear : A Joke in One Act, or The Boor - Anton Chekhov (Any Edition)

Unit III- Language skills and Communicative English **14 hrs**

Phonetics and Pronunciation 14 Hrs

- Introduction to Speech Organs.
- Sounds Transcription.
- Words Stress.
- Sentence Stress.

Competitive English

- Contextual Meaning.
- Para Jumble.
- Analogy
- Idioms Phrases.

Unit-IV - Language Use - Grammar and Composition **10 Hrs**

- Vocabulary and Punctuation marks.
- Sentences- Simple, Compound, Complex.
- Sentences- Conditional Sentences.
- Reported Speech.

Suggested Readings:

1. Other dramas of Williams Shakespeare.
2. Other plays of Anton Chekhov.
3. R. P. Singh's Functional Skills in Language and Literature, OUP
4. Raymond Murphy's Essential Grammar in Use, CUP
5. S.P. Bakshi's Objective General English, Arihant Publications.
6. Peter Roach's English Phonetics and Phonology: A Practical Course, CUP
7. Balasubramanian's Textbook Of English Phonetics For Indian Students 3Rd Edition, Trinity Press
8. Question papers of Competitive exams

Teaching Pedagogy:

- Lecture method, Group Discussion, Presentation, Power point Presentation, Videos, Animation and Activity based etc.

SEE QUESTIONS PATTERN

1. 2 Marks Questions 2 X 4 = 08
2. 5 Marks Questions 5 X 4 = 20
3. 8 Marks Questions 8 X 4 = 32

Sl.No.	Title	Teaching Hr	Marks Per Unit	2 Marks	5 Marks	10 Marks	Total
1.	Drama	20	24[48]	-	-	03[06] (4+4/2+6//8)	24[48]
2.	One Act Play	10	08[16]	-	-	01[02] (4+4/2+6//8)	08[16]
3.	Language skills and Communicative English	16	20[40]	-	04[08] (2+3/1+4/5)	-	20[40]
4.	Language Use - Grammar and Composition	10	08[16]	04[08] (1+1/2)	-	-	08[16]
	Total	52	60	08[16]	20[40]	32[64]	60[120]

Details of Formative assessment (IA) for AECC

Type of Assessment	marks	Duration
C-1 Written test-1	10	1 hr
C-2 Written test-2	10	1 hr
C-3 Seminar/ Assignment/ Project work/ Activity	20	
Total	**40**	

B.Sc. - IV SEMESTER
ENGLISH TREASURE-2

Course Code: 113AECC4 **CIA Marks : 40**
Teaching Hrs : 52 **SEE Marks : 60**
Scheme : 4:0:0 **Credit : 03**

Course objectives: This course will enable the students to:

* To read and comprehend scientific fictions and essays.
* To demonstrate proper presentation skills and utilize employability skills.
* To comprehend research methodologies and research writing.
* To develop soft Skills.
* To apply the qualities of equality, scientific vision, balancing tradition and modernity.

Course Outcome: After successful completion of the course, students are able to:

113AECC4.1 To identify and comprehend scientific fictions and essays.
113AECC4.2 To comprehend the techniques of professional writing skills.
113AECC4.3 To know and practice various placement skills and apply communication skills and Professional skills.
113AECC4.4 To utilize the methods of research paper writing and conduct researches that contribute to the development of human resources.
113AECC4.5 To develop their overall personality by utilizing scientific vision, respecting cultural Differences, applying human values and the critical thinking skills

Mapping of CO with PO and PSO:

CO.	PO									
	1	2	3	4	5	6	7	8	9	10
113AECC4.1						2				
113AECC4.2			3			3				
113AECC4.3			3			3				
113AECC4.4						2				
113AECC4.5						2	2			2

Course Content :

Unit I - Novel **20 Hrs**

The Calcutta Chromosome (Any Edition) - Amitav Ghosh

Unit II - Essay and Speech **08 hrs**

Of Studies (Essay) - Francis Bacon
Gender Equality is Your Issue Too (Speech) - Emma Watson

Unit III- Language skills and Communicative English **14 hrs**

Official Correspondence:

- Agenda
- Notice
- Minutes
- Memo
- E-mail etiquette

Placement Skills:

- Job applications
- Presentation Skills
- Joining Letter
- Interview skills
- Group Discussion

Unit-IV - Research Skills **08 Hrs**

- Research Paper Writing
- Research Methodology
- Formatting
- Reference and work cited
- Plagiarism

Suggested Readings:

1. Handbook 9th Edition, The Modern Language Association of America
2. M. K. Naik's A History of Indian English Literature
3. Panneerselvam.R's Research Methodology
4. Other Novels of Amitav Ghosh.
5. Other Essays of Francis Bacon.
6. Making the Most of Your Placement, Sage Publications.
7. Barun Mitra Personality Development and Soft Skills.
8. S. Parthasarathy's Placement Preparation.

Teaching Pedagogy:

- Lecture method, Group Discussion, Presentation, Power point Presentation, Videos, Animation and Activity based etc.

SEE QUESTIONS PATTERN

1. 2 Marks Questions 2 X 4 = 08
2. 5 Marks Questions 5 X 4 = 20
3. 8 Marks Questions 8 X 4 = 32

Time: 21/2 Hrs **Max Marks: 60**

Sl.No.	Title	Teaching Hr	Marks Per Unit	2 Marks	5 Marks	10 Marks	Total
1.	Novel	20	24[48]	-	-	03[06] (4+4/2+6//8)	24[48]
2.	Essay -Speech	08	08[16]	-	-	01[02] (4+4/2+6//8)	08[16]
3.	Language skills and Communicative English	16	20[40]	-	04[08] (2+3/1+4/5)	-	20[40]
4.	Research Methodology	08	08[16]	04[08] (1+1/2)	-	-	08[16]
	Total	52	60	08[16]	20[40]	32[64]	60[120]

Details of Formative assessment (IA) for AECC

Type of Assessment	marks	Duration
C-1 Written test-1	10	1 hr
C-2 Written test-2	10	1 hr
C-3 Seminar/ Assignment/ Project work/ Activity	20	
Total	**40**	

DEPARTMENT OF HINDI
B.Sc. III SEMESTER (NEP)
NATAK TATHA SARKARI PATRACHAR

Course Code : 114HIN03T **CIA Marks :40**
Teaching Hrs : 52 **SEE Marks :60**
Scheme: 4:0:0 **Credits: 3**

Course objectives: This course will enable the students to

1. To appreciate the drama.
2. To understand the thought and imagination contained in the drama.
3. To appreciate the dialogues and characters of of the drama.
4. To train the emotions, feelings and imagination.
5. To develop their communications skills on official letter writing.
6. To create love for Hindi drama and communications skills in the competitive world.

Course Outcome: After successful completion of the course, students are able to;

- ❖ 114HIN03T-1: Development of oral reading and writing power
- ❖ 114HIN03T-2: Sublimation of emotions and their cooperation in personality building
- ❖ 114HIN03T-3:Giving right direction and vision to conscience richness and emotional expression
- ❖ 114HIN03T-4:Gaining knowledge from other genres of literature by joining the actors of drama
- ❖ 114HIN03T-5: Providing new aesthetic feeling towards the living world and literature
- ❖ 114HIN03T-6: Imparting global values by extension of ethical values and develop logic towards philosophy of life

Mapping of CO with PO and PSO:

CO.	PO									
	1	2	3	4	5	6	7	8	9	10
114HIN03T-1 :						2			1	
114HIN03T-2 :						2			2	
114HIN03T-3 :						2			2	
114HIN03T-4 :						2			2	
114HIN03T-5 :						2			1	
114HIN03T-6 :						2			1	

Unit	Content	Hours
1	डा रामकुमार वर्मा का व्यक्तित्व एवं कृतित्व का संक्षिप्त परिचय।	13
2	अग्निशिखा नाटक का पठन, एवं विश्लेषण और विवेचनात्मक अध्ययन	13
3	अग्निशिखा नाटक के तात्विक विश्लेषण (कथावस्तु, पात्र और चरित्र, कथोपकथन, अभिनय, देशका□ और वातावरण, भाषा-शै□ी तथा उद्देश्य।)	13
4	सरकारी पत्राचार- अर्धसरकारी पत्र, कार्या□य आदेश, कार्या□य ज्ञापन, परिपत्र, अनुस्मारक, अधिसूचना ।	13

REFERENCE BOOKS :

1. हिंदी नाटक का उदभव एवं विकास - डा- दशरथ ओझा
2. हिंदी नाटक साहित्य का आ□ोचनात्मक अध्ययन- डा- रामचरण
3. हिंदी के स्वच्छंदतावादी नाटक- डा-देवेर्शी सनादय
4. हिंदी के समस्यात्मक नाटक-विनयकुमार
5. रंगमंच और नाटक की भूमिका-□क्ष्मीनारायण
6. हिंदी एकांकी नाटक और एकांकीकार- डा रामचरण

Model Questions

Sl. No.	Question Marks	CO	BTL
1.	Dr. Ramkumar Verma ka jeevan parichaya likiye	2	3
2.	Nataka ka arth likiye	2	3
3.	Agnishikha nataka ka uddesha likiye	5	3
4.	Karyalaya aadhesh patra ka namuna likiye.	5	3
5.	Agnishikha nataka ke kathavastu ka vishleshan kijiye.	8	3
6.	Adhisuchana ka artha likte huye udaharan dijiye.	8	3

Blue Print: B.Sc. III Semester (Max. Marks. 60)

Unit	Name of the topic	Teaching Hours	Marks per Unit	2 Mark	5 Marks	8 Marks	Total Marks
1	डा रामकुमार वर्मा का व्यक्तित्व एवं कृतित्व का संक्षिप्त परिचय।	13	30	2	2	2	30
2	अग्निशिखा नाटक का पठन, एवं विश्लेषण और विवेचनात्मक अध्ययन	13	30	2	2	2	30
3	अग्निशिखा नाटक के तात्विक विश्लेषण (कथावस्तु, पात्र और चरित्र, कथोपकथन, अभिनय, देशका□ और वातावरण, भाषा-शै□ी तथा उद्देश्य।)	13	30	2	2	2	30
4	सरकारी पत्राचार- अर्धसरकारी पत्र, कार्या□य आदेश, कार्या□य ज्ञापन, परिपत्र, अनुस्मारक, अधिसूचना ।	13	30	2	2	2	30
	Total	52	120	8	8	8	120

Teaching Pedagogy:

Lecture method, Group Discussion, Presentation, Videos and Activity based etc

DEPARTMENT OF HINDI
B.Sc. IV SEMESTER (NEP)

UPANYAS TATHA NIBANDH (NOVEL AND ESSAY)

Course Code : 114HIN04T **CIA Marks :40**
Teaching Hrs : 52 **SEE Marks :60**
Scheme: 4:0:0 **Credits: 3**

Course objectives: This course will enable the students to

1. To understand the thought and imagination contained in the Upanyas
2. To appreciate the dialogues and characters of the Upanyas.
3. To train the emotions, feelings and imagination in the Upanyas.
4. To understand and appreciate the different types of nibandh.
5. To develop the power of imagination explanation, critical thinking and moral values through teaching of essays
6. To understand and to describe the meaning and idea given in the particular text.

Course Outcome: After successful completion of the course, students are able to;

- 114HIN04T-1: To arouse interest in literature among the students.
- 114HIN04T-2: Development of creative power
- 114HIN04T-3: To awaken about words, proverbs, idioms, and proverbs etc.
- 114HIN04T-4: To develop the ability to guess.
- 114HIN04T-5: To expand concentration.
- 114HIN04T-6: To develop the creativity of the novel and to develop imagination and memory.

Mapping of CO with PO and PSO:

CO.	PO									
	1	2	3	4	5	6	7	8	9	10
114HIN04T-1:						2			1	
114HIN04T-2:						2			2	
114HIN04T-3:						2			2	
114HIN04T-4:						2			2	
114HIN04T-5:						2			1	
114HIN04T-6:						2			1	

Unit	Content	Hours
1	उपन्यासकार के व्यक्तित्व एवं कृतित्व का परिचय। यादों के झरो के से, प्यार का झोंका।	13
2	दूर कहीं मंजि□ है अपनी बद□ते रिस्ते, नई नन्ही मेहमान।	13
3	दर्द का तूफान, सहनता की सीमा पारकर.	13
4	वैज्ञानिक निबंध- उदाहरण : पर्यावरण संतु□न, 'कोविड- 19, बन संपत्ति, सुपर कंप्यूटर, नये अविष्कार, सांक्रमिक बीमारियाँ।	13

Reference books:

1. हिंदी उपन्यास- डा शिवनारायण
2. हिंदी उपन्यास पहचान और परखडा □द्रनाथ मदान
3. प्रेमचंदत्तोर उपन्यासों की शिल्प विधि-सत्पा□ चुध
4. हिंदी उपन्यास स्थिति और गति-डा-चंद्रकांत बाँदिवाडेकर

Model Questions

Sl. No.	Question	Marks	CO	BTL
1.	Premachand ji ka jeevan parichaya likiye	2	3	
2.	Nibandh ka arth likiye	2	3	
3.	'Doora kahi manjil hai' upanyas ka uddesha likiye	5	3	
4.	Nibandh ke prakara likiye.	5	3	
5.	'Badalte rishte' upanyas ka tatvik vivechana kijiye.	8	3	
6.	'Covid-19' par nibandh likiye.	8	3	

Teaching Pedagogy:

Lecture method, Group Discussion, Presentation, Videos and Activity based etc.

Blue Print: B.Sc. IV Semester (Max. Marks. 60)

Unit	Name of the topic	Teaching Hours	Marks per Unit	2 Mark	5 Marks	8 Marks	Total Marks
1	उपन्यासकार के व्यक्तित्व एवं कृतित्व का परिचय। यादों के झरो के से, प्यार का झोंका।	13	30	2	2	2	30
2	दूर कहीं मंजि□ है अपनी बद□ते रिस्ते, नई नन्ही मेहमान।	13	30	2	2	2	30
3	दर्द का तूफान, सहनता की सीमा पारकर.	13	30	2	2	2	30
4	वैज्ञानिक निबंध- उदाहरण : पर्यावरण संतु□न, 'कोविड-19, बन संपत्ति, सुपर कंप्यूटर, नये अविष्कार, सांक्रमिक बीमारियाँ।	13	30	2	2	2	30
	Total	52	120	8	8	8	120

DEPARTMENT OF PHYSICS
III SEMESTER
WAVE MOTION AND OPTICS

Course Code: 115DSC03T **CIA Marks :40**
Teaching Hrs : 60 **SEE Marks :60**
Scheme: 4:0:0 **Credits: 4**

Course objectives: This course 115DSC03T will enable the students to

- ❖ Understand wave motion and super position theorem.
- ❖ Understand diffraction, interference and polarization of light.

Course Outcome: After successful completion of the course, students are able to;

- ❖ 115DSC03T.1 - Explain the parameters and superposition of waves.
- ❖ 115DSC03T.2 - Discuss characteristics of sound and acoustics of buildings.
- ❖ 115DSC03T.3 - Compare different theories of light and its phenomena.

Mapping of CO with PO and PSO:

CO.	PO										PSO-1	PSO-2	PSO-3	PSO-4
	1	2	3	4	5	6	7	8	9	10	PCM	PCM	PCM	PCM
115DSC03T.1	3	3				3					3	3	3	3
115DSC03T.2	3	3	2	3		3					3	3	3	3
115DSC03T.3	3	3	2	3		3					3	3	3	3

Course Content :

Unit-1 :Waves and Superposition of Harmonic Waves: **15hrs**

Chapter-1 : Simple hormonic motion and wave: Simple hormonic motion (S.H.M), Characteristics of S.H.M, Plane Progressive (Travelling) Wave and its equation, Wave Equation –Differential form (derivation).

Particle and Wave Velocities : Relation between them, Energy Transport – Expression for intensity of progressive wave,

Chapter-2 : Superposition of Harmonic Waves: Superposition Principle: Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats) – Analytical treatment. Superposition of two perpendicular Harmonic Oscillations: Lissajous Figures with equal and unequal frequency- Analytical treatment.

Topics for self-study: Uses of Lissajous' figures.

Suggested Activities:

Activity No-1: Preparation of report and presentation on harmonics in musical instruments possible.

Activity No-2 : Study of Characteristics of loud speaker and microphone.

Unit-2 : Standing Waves, Sound and Acoustics

Chapter-3 : Standing Waves: Types of wave, formation & characteristics of stationary waves, Vibrations of stretched string: velocity and frequency of transverse waves, laws of transverse vibrations.

Chapter- 4 : Sound: Sound and characteristics, Pitch and frequency, intensity loudness, noise and music Newton's Formula for Velocity of Sound. Laplace's Correction (Derivation).

Chapter-5 : Acoustics: Absorption coefficient, Reverberation and Reverberation time, Sabine's Reverberation formula (derivation), Factors affecting acoustics in buildings, Requisites for good acoustics. Acoustic measurements.

Topics for self-study : Normal Modes of vibrations in Open and Closed Pipes – Analytical treatment. Concept of Resonance, Theory of Helmholtz resonator. Brief account of Ripple and Gravity Waves.

Suggested Activities:

Activity No-3 : Preparation of report and presentation on resonance phenomenon in natural and artificial systems.

Activity No-4 : Visit to auditorium and preparation of report on materials / designs used for good acoustics.

Unit-3 : Interference:

Chapter- 6 : Interference of light by division of wave front: Huygen's theory and principle, Interference of light waves by division of wave-front- Young's double slit experiment- derivation of expression for fringe width-Fresnel Biprism, Numerical Problems.

Chapter- 7: Interference of light by division of amplitude: Interference by division of amplitude: Interference by a plane parallel film illuminated by light- color of thin films Newton's rings-(Reflected light)-Michelson Interferometer-Determination of wavelength of light.

Topics for self-study : Interference by a non-parallel reflecting surfaces.

Suggested Activities:

Activity no-5: Make Double Slit Experiment Reference (https://www.youtube.com/watch?v=kKdaRJ3vAmA)

Activity -8: Activity: What is the reason for the colors like rainbow which we see on ground when oil/petrol spills during rainfall?

Reference: https://www.scientificamerican.com/article/why-do-beautiful-bands-of/

Unit-4 : **Diffraction and Polarization :**

Chapter -8 : Fraunhofer diffraction: Introduction- Fraunhofer diffractions- Single slit, double slit diffraction. Theory of plane transmission grating, Resolving power of a grating and prism.

Chapter-9 : Fresnel Diffraction: Fresnel Diffraction- Fresnel half period zones- Diffraction by a circular aperture, diffraction by a straight edge, zone plate, comparison between zone plate and convex lens.

Chapter -10 : Polarization: Production of plane polarized light, Quarter wave plate and half wave plate, Analysis of polarized light, Optical activity - Laurent half shade polarimeter.

Topics for self-study : Production of circularly polarized light

Activity no- 6: Using CDS and DVDS as diffraction Gratings 1

Referance:https://www.nnin.org/sites/default/files/files/Karen_Rama_Using_CDs_AND_DVDs_AS_DIFFRACTION_GRATINGS_0.pdf

Activity no-7 : What is the physics behind 3D movies? Group Discussion (https://www.slideserve.com/rae/physics-behind-3d-movies-powerpoint-pptpresentation)

REFERENCE BOOKS :

1. The Physics of Waves and Oscillations, N K Bajaj Tata McGraw-Hill Publishing Company Ltd.,Second Edition, 1984
2. Waves and Oscillations , N Subramanyamand Brij Lal Vikas Publishing House Pvt. Ltd., Second Revised Edition 2010
3. A Text Book of Sound , D R Khanna and RS Bedi Atma Ram & Sons, Third Edition, 1952
4. Oscillations and Waves Satya Prakash Pragathi Prakashan, Meerut,Second Edition 2003
5. Optics Ajoy Ghatak McGraw Hill Education (India) Pvt Ltd 2017
6. A text Book of Optics Brij Lal, M N Avadhanulu & N Subrahmanyam, S. Chand Publishing 2012
7. Berkeley Physics Course –Waves,Frank S Crawford Jr. Tata Mc Graw-Hill Publishing Company Ltd.,Special Indian Edition,. 2011
8. Optics, Eugene Hecht Pearson Paper back 2019
9. Introduction To Optics, Pedrotti and Frank L, Pearson India 3rd Edition,
10. Fundamentals of Optics, Francis JenkinsHarvey White McGraw HillEducation 2017
11. Electronic Devices and Circuits, David A. Bell PHI, New Delhi, 2004
12. Integrated Electronics, Jacob Millman and CC Halkias
13. Digital Fundamentals, Floyd PHI, New Delhi, 2001

Unit	Name of the topic	Teaching Hrs	Marks per Unit	2 marks	5 marks	10 marks	Total Marks
I	1. Simple hormonic motion and wave 2. Superposition of Harmonic Waves	15	30	2T/2P	2T/2P	2T	30
II	3. Standing Waves 4. Sound 5. Acoustics	15	30	2T/2P	2T/2P	2T	30
III	6. Interference of light by division of wave front 7. Interference of light by division of amplitude	15	30	2T/2P	2T/2P	2T	30
IV	8. Fraunhofer diffraction 9. Fresnel Diffraction 10. Polarization	15	30	2T/2P	2T/2P	2T	30
	TOTAL	**60**	**120**	**16**	**40**	**64**	**120**

III SEMESTER
WAVE MOTION AND OPTICS PRACTICAL

Course Code: 115DSC03P **CIA Marks :20**
Teaching Hrs : 40 **SEE Marks :30**
Scheme: 0:0:4 **Credits: 2**

Course objectives: This course (115DSC03P) will enable the students to

- ❖ Understand working of a spectrometer
- ❖ Understand diffraction, interference and polarization of light.

Course Outcome: After successful completion of the course, students are able to;

- ❖ 115DSC03P.1 - Illustrate superposition of waves.
- ❖ 115DSC03P.2 - Compute different parameters of prism
- ❖ 115DSC03P.3 - Determine the resolving power and dispersive power of prism and grating.
- ❖ 115DSC03P.4 - Measure wavelength and intensity of light

Mapping of CO with PO and PSO:

CO.	PO										PSO-1	PSO-2	PSO-3	PSO-4
	1	2	3	4	5	6	7	8	9	10	PCM	PCM	PCM	PCM
115DSC03P.1	1			3		2				2	3	3	3	3
115DSC03P.2	1			3		2				2	3	3	3	3
115DSC03P.3	1			3		2				2	3	3	3	3
115DSC03P.4	1			3		2				2	3	3	3	3

Course Content :

1. Velocity of sound through a wire using Sonometer.
2. Frequency of AC using Sonometer.
3. Study of Lissajous' Figures
4. To verify the laws of transverse vibration using Melde's apparatus.
5. Helmholtz resonator using tuning fork.
6. Helmholtz resonator using electrical signal generator.
7. To determine refractive index of the Material of a prism.
8. To determine the dispersive power and Cauchy constants of the material of a prism.
9. To determine the wavelength of sodium source using Michelson's interferometer.
10. To determine wavelength of sodium light using Fresnel Biprism.
11. To determine wavelength of sodium light using Newton's Rings
12. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
13. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
14. To determine dispersive power and resolving power of a plane diffraction grating.
15. Demonstration of experiments through virtual lab.

Note:

1. Minimum EIGHT experiments have to be carried out.;
2. New experiments may be added.

Reference Books:

1. Advanced Practical Physics for students: B.L. Flint and H. T. Worsnop
2. A Text Book of Practical Physics: I. Prakash & Ramakrishna
3. Advanced level Physics Practical's: Michael Nelson and Jon M. Ogborn
4. A Laboratory Manual of Physics for undergraduate classes: D. P. Khandelwal

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	02
2	Circuit/block diagram	03
3	Experiment skill and connection	03
4	Tabular column	02
5	Record of observations	05
6	Graph and calculations	05
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**30**

III SEMESTER
NANOTECHNOLOGY

Course Code: 115OEC03T **CIA Marks : 45**
Teaching Hrs : 45 **SEE Marks : 65**
Scheme: 3:0:0 **Credits: 3**

Course objectives : This course (115OEC03T) will enable the students to

- ❖ Understand the types of nanostructures.
- ❖ Understand thin film solar cells.

Course Outcome: After successful completion of the course, students are able to;

- ❖ 115OEC03T.1 – Differentiate between 1-D, 2-D and 3-D nanostructures by knowing the fundamentals of nanoscience.
- ❖ 115OEC03T.2 – Explain the synthesis of nanomaterials by different methods.
- ❖ 115OEC03T.3 – Explain material aspects and applications of nanomaterials.

Mapping of CO with PO and PSO:

CO.	PO										PSO-1	PSO-2	PSO-3	PSO-4
	1	2	3	4	5	6	7	8	9	10	PCM	PCM	PCM	PCM
115OEC03T.1	3	3		3		3		2			3	3	3	3
115OEC03T.2	3	3		3		3		2			3	3	3	3
115OEC03T.3	3	3		3		3		2			3	3	3	3

Course Content:

Unit-1 :Introduction to nanomaterials :

Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nanoscale, Size Effects in nano-systems, Quantum confinement. Applications of 1D, 2D and 3D nanomaterials.

Unit-2 : Synthesis and Characterization of nanostructure materials :

Top down and Bottom up approach, Ball milling. Gas phase condensation. Vacuum deposition. Physical vapor deposition (PVD): Thermal evaporation, Chemical vapor deposition (CVD). Sol-Gel. Spray pyrolysis. Hydrothermal synthesis. X-Ray Diffraction (Crystallite size calculation). Scanning Electron Microscopy. Transmission Electron Microscopy.

Unit-3 : Properties and applications of nanomaterials :

Optical properties of nanomaterials, FTIR, UV visible, Raman Spectroscopy measurements, Magnetic properties- SQUID,

Applications of nanoparticle- quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage. magnetic data storage. CNT based transistor Biological applications- Biochemical sensor, Membrane based water purification.

Activities for carries out :

1. Synthesis of nanoparticles by chemical route.
2. XRD pattern of nanomaterials and estimation of particle size.
3. To study the effect of size on color of nanomaterials.
4. Visit to nearby research labs to study the working of XRD, SEM, UV-Visible
5. Spectrophotometer instruments
6. Visit to nearby research labs for project work and interaction with scientists at IISC,
7. JNCASR, University Scientific and Instruments Center (USIC), etc.

Reference Books :

1. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).
2. M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Nanoparticle Technology Handbook (Elsevier, 2007).
3. Introduction to Nanoelectronics, V.V. Mitin, V.A. Kochelap and M.A. Stroscio, 2011,Cambridge University Press. Bharat Bhushan, Springer Handbook of Nanotechnology (Springer-Verlag, Berlin, (2004).

Unit	Name of the topic	Teaching Hrs	Marks per Unit	2 marks	5 marks	10 marks	Total Marks
I	Introduction to nanomaterials	15	32	3T	2T	2T	32
II	Synthesis and Characterization of nanostructure materials:	15	45	3T	3T	3T	45
III	Properties and applications of nanomaterials	15	43	2T	3T	3T	43
	TOTAL	**45**	**120**	**16**	**40**	**64**	**120**

III SEMESTER
OPTICAL INSTRUMENTATION

Course Code: 115SBC03P **CIA Marks :25**
Teaching Hrs : 40 **SEE Marks :30**
Scheme: 0:0:4 **Credits: 2**

Course objectives: This course (115SBC03P) will enable the students to

- ❖ Understand the usage of various tools
- ❖ Understand the usage of spectrometer.

Course Outcome: After successful completion of the course, students are able to;

- ❖ 115SBC03P.1 - Explain the usage of various measuring tools.
- ❖ 115SBC03P.2 - Describe various workshop techniques.
- ❖ 115SBC03P.3 - Apply the knowledge of optics, LASER and optical fiber to implement engineering applications.

Mapping of CO with PO and PSO:

CO.	PO										PSO-1	PSO-2	PSO-3	PSO-4
	1	2	3	4	5	6	7	8	9	10	PCM	PCM	PCM	PCM
115SBC03P.1	3		3	3		3					3	3	3	3
115SBC03P.2	3		3	3		3					3	3	3	3
115SBC03P.3	3	2	3	3							3	3	3	3

Course Content :

Laser : Spontaneous and stimulated emissions, Theory of laser action, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers, Study of diffraction grating. Spectrometer: Component study of spectrometer, reading Spectrometer scale, Measuring the Angle prism and Minimum Deviation, mentioning applications of spectrometer, Uses of Micrometer. Optical fibres and their properties, Principal of light propagation through a fiber, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibers, Solar radiations and its applications

List of laboratories skill-based experiments:

Expt no. Title of experiment

1. Determination of particle size of lycopodim powder using semiconductor laser.
2. Determination of Numerical aperture and acceptance angle of an optical fibre.
3. Study of Bending losses of optical fibre.
4. Assembling of solar cell (model)
5. Study of Newton's rings using white light and monochromatic light- radius of curvature of a plano-convex lens
6. Determine the wavelength of sodium light by newton's ring
7. Study of spectrometer:

8. Dispersive power of the material of a prism – spectrometer
9. Determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
10. Determine the wavelength of given laser light by double slit experiment, hence find the width of the given slit responsible for diffraction.
11. Determine the wavelength of sodium light using Michelson's interferometer.

Activity :

Demonstration of Spectrometer experiments to High school students. Assembling of solar cell kit and study the characteristics properties. Study of applications of laser and optical fiber.

Reference Books:

1. B.Sc. practical Physics – C.L. Arora.
2. Advanced practical Physics – Samir Kumar Ghosh.
3. Advanced practical Physics – Worsnop and Flint.

Sl. No.	Particulars	Marks
1.	Relevant formula and nature of graph	02
2.	Circuit/block diagram	03
3.	Experiment skill and connection	03
4.	Tabular column	02
5.	Record of observations	05
6.	Graph and calculations	05
7.	Unit and accuracy	02
8.	Journal	04
9.	Oral	04
	TOTAL	**30**

DEPARTMENT OF PHYSICS
IV SEMESTER
THERMAL PHYSICS AND ELECTRONICS

Course Code: 115DSC04T **CIA Marks : 40**
Teaching Hrs : 60 **SEE Marks : 60**
Scheme: 4:0:0 **Credits: 4**

Course objectives: This course (115DSC04T) will enable the students to
- ❖ Understand thermodynamics and its laws.
- ❖ Understand basic electronics.

Course Outcome: After successful completion of the course, students are able to;

115DSC04T.1 - Illustrate the working of different heat engines by different thermodynamic laws.
115DSC04T.2 - Explain the variation of entropy and enthalpy with different parameters.
115DSC04T.3 - Illustrate the laws of black-body radiation motion of gas molecules.
115DSC04T.4 - Interpret electronic circuits using theorems and Boolean algebra

Mapping of CO with PO and PSO:

CO.	PO										PSO-1	PSO-2	PSO-3	PSO-4
	1	2	3	4	5	6	7	8	9	10	PCM	PCM	PCM	PCM
115DSC04T.1	3	3				3					3	3	3	3
115DSC04T.2	3	3	2	3		3					3	3	3	3
115DSC04T.3	3	3	2	3		3					3	3	3	3
115DSC04T.3	3	3	2	3		3					3	3	3	3

Course Content :

Unit-1 :Thermodynamics:

Chapter-1: Fundamentals of thermodynamics: Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics, Concept of Temperature, Concept of Heat and work, First Law of Thermodynamics and its differential form, Internal Energy, Applications of First Law: Equation of state for an adiabatic process, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient.

Chapter -2 : Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines: Carnot engine, Carnot cycle & efficiency. 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Petrol engine.

Topics for self-study : Heat engine -Diesel engine

Suggested Activities

Activities: 1 Make a write up of heat engines and refrigerators.

Activities:2 List the irreversible and irreversible processes which we may come across.

Unit-2 : Entropy and Enthalpy

Chapter - 3 : Entropy: Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a perfect gas. Entropy Changes in Reversible and Irreversible processes with examples. Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle.

Chapter - 4 : Enthalpy: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their relations, Properties and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization.

Topics for self-study : Third Law of Thermodynamics.

Activity -3 : Three important concepts in the study of thermodynamics are, temperature, heat, and internal energy. Discuss the meaning of these three concepts being careful to distinguish between them.

http://www.physics.umd.edu/perg/abp/think/thermo/te mper.htm

Unit-3 :Thermodynamic Potentials :

Chapter- 5: Maxwell's Thermodynamic Relations: Derivations of Maxwell's Relations and its Applications: (1) Clausius-Clapeyron equation, (2) Values of CP-CV, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waals Gases.

Chapter - 6 : Kinetic Theory of Gases: Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas: Mean, RMS and Most Probable Speeds. Degrees of Freedom, Law of Equipartition of Energy (no derivation). Specific heats of Gases.

Topics for self-study: Applications of Maxwell's Relations:- Energy equations, Change of Temperature during Adiabatic Process.

Activity - 4 : Activity Based Physics Thinking Problems in Thermodynamics: Kinetic Theory http://www.physics.umd.edu/perg/abp/think/thermo/kt.ht m

Unit-4 : **Radiation and Electronics:**

Chapter - 7 : Radiation: Blackbody radiation, spectral distribution, concept of energy density and pressure of radiation (no derivation). Derivation of Planck's law, deduction of Stefan - Boltzmann law.

Chapter -8 : Junction Transistors: Basics of BJT, BJT operation (qualitative of biasing and feedback techniques), Common Emitter Characteristics, BJT- CE amplifier analysis, Problems.

Chapter -9 : Network theorems: Introduction, superposition theorem Thevenin & Norton's theorems, maximum power transform theorem for circuits with independent and dependent sources.

Chapter -10 : Boolean Algebra Theorems: Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, NAND Gate, NAND TO OR,AND, NOT & XOR gate, Algebraic Simplification.

Topics for self-study : NAND and NOR Implementation: NAND Implementation, NOR Implementation

Activity - 5 :

1. Measuring the Solar Constant
   Materials: Simple flat sided Jar and Thermometer.
   Activity: Bottle containing water is exposed to solar radiation. The raise in the temperature and time taken are noted. Calculate the heat absorbed by water and relate it to the output of Sun.
2. Inverse square law of radiation
   Materials: A cardboard with grid, a cardboard with a hole, supporting clips, ruler, candle.

Activity - 6:

1. Learn how to implement logic functions (AND and OR) using just diodes and resistors.
2. Understand the concept of virtual ground of an OP- AMP.
3. Listing the applications of op-amps.

Reference Books :

1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
2. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
3. A Treatise on Heat, Meghnad Saha, and B.N.Srivastava, 1958, Indian Press
4. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer.
5. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger. 1988, Narosa.
6. An Introduction to Thermal Physics, Daniel V Schroeder, 2020, Oxford University Press

Unit	Name of the topic	Teaching Hrs	Marks per Unit	2 marks	5 marks	8 marks	Total Marks
I	1. Fundamentals of thermodynamics	15	30	2T/2P	2T/2P	2T	30
	2. Second Law of Thermodynamics						
II	3. Entropy						
	4. Enthalpy	15	30	2T/2P	2T/2P	2T	30
III	5. Maxwell's Thermodynamic Relations						
	6. Kinetic Theory of Gases	15	30	2T/2P	2T/2P	2T	30
IV	7. Radiation	15	30	2T/2P	2T/2P	2T	30
	8. Junction Transistors						
	9. Network theorems						
	10. Digital Electronics & Boolean Algebra Theorems						
	TOTAL	**60**	**120**	**16**	**40**	**64**	**120**

IV SEMESTER
THERMAL PHYSICS AND ELECTRONICS

Course Code: 115DSC04P **CIA Marks :20**
Teaching Hrs : 40 **SEE Marks :30**
Scheme: 0:0:4 **Credits: 2**

Course objectives: This course (115DSC04P) will enable the students to

- ❖ Understand specific heats of different liquids.
- ❖ Understand thermal conductivity of different solids.
- ❖ Understand the application of Stefan's law to Black-body.

Course Outcome: After successful completion of the course, students are able to;

- ❖ 1115DSC04P.1 - Determine the thermal co-efficient of good and bad conductors.
- ❖ 115DSC04P.2 - Measure the specific heats of the liquids by different methods.
- ❖ 115DSC04P.3 - Illustrate the laws of black-body radiation.
- ❖ 115DSC04P.4 - Estimate the mechanical equivalent of heat.
- ❖ 115DSC04P.5 - Demonstrate thermo electric phenomena.

Mapping of CO with PO and PSO:

CO.	PO										PSO-1	PSO-2	PSO-3	PSO-4
	1	2	3	4	5	6	7	8	9	10	PCM	PCM	PCM	PCM
115DSC04P.1	1			3		2				2	3	3	3	3
115DSC04P.2	1			3		2				2	3	3	3	3
115DSC04P.3	1			3		2				2	3	3	3	3
115DSC04P.4	1			3		2				2	3	3	3	3
115DSC04P.5	1			3		2				2	3	3	3	3

Course Content :

1. Mechanical Equivalent of Heat by Callender and Barne's method
2. Coefficient of thermal conductivity of copper by Searle's apparatus
3. Coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method
4. Value of Stefan's constant
5. Verification of Stefan's law
6. Variation of thermo-emf across two junctions of a thermocouple with temperature
7. Verification of Clasius –Clapeyron equation and determination of specific enthalpy
8. Measurement of Planck's constant using black body radiation.
9. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
10. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
11. Study of transistor amplifier in CE mode.
12. Study of the Norton and Thevenin's theorem.
13. Verification of De Morgan's theorem.
14. Study of logic gates.
15. Demonstration of experiments through virtual lab.

Reference Books:

1. Advanced Practical Physics for students: B.L. Flint and H.T. Worsnop
2. A Text Book of Practical Physics: I. Prakash & Ramakrishna
3. Advanced level Physics Practical's: Michael Nelson and Jon M. Ogborn
4. A Laboratory Manual of Physics for undergraduate classes: D.P.Khandelwal

Sl. No.	Particulars	Marks
1.	Relevant formula and nature of graph	02
2.	Circuit/block diagram	03
3.	Experiment skill and connection	03
4.	Tabular column	02
5.	Record of observations	05
6.	Graph and calculations	05
7.	Unit and accuracy	02
8.	Journal	04
9.	Oral	04
	TOTAL	**30**

DEPARTMENT OF CHEMISTRY
B.Sc. SEMESTER - III (DSCC)
GENERAL CHEMISTRY

Course Code: 116DSC03T **CIA Marks : 40**
Teaching Hrs : 56 **SEE Marks : 60**
Credits: 4 **Total Marks : 100**

Course objectives: This course (116DSC03T) will enable the students to

CO1: Explain the properties of s and p block elements and bonding systems in inorganic compounds.
CO2: Describe the preparation, general mechanism and reactivity of benzene organic halides and phenols.
CO3: Discuss the principles of thermodynamics and chemical equilibrium
CO4: Distinguish the important aspects of renewable and non-renewable energy resources.

Course Content :

Unit - I - : CHEMICAL BONDING & CHEMISTRY OF s- & p- BLOCK ELEMENTS 14 hrs

Metallic Bond : Explanation of physical properties of metals (conductivity, lustre, malleability, ductility and cohesive force) based on free electron theory. Band theory of metals to explain conductors, insulators, extrinsic and intrinsic semi conductors.

Hydrogen bond : Definition, properties and types of hydrogen bond. Consequences of hydrogen bonding.

Van der Waals forces: Definition and types of van der Waals forces. Factors affecting the strength and magnitude of van der Waals forces.

Chemistry of s- and p- block elements: General characteristics, anomalous properties of lithium. Diagonal relationship of Li with Mg, and Be with Al. Preparation, uses, structure and bonding in diborane, borazine, boron nitride and carboranes. Silicates-Classification and structures.

Preparation, properties and structure of oxides and oxyacids of nitrogen. Preparation and bonding in oxoacids of phosphorus, sulphur and chlorine. Inter halogen compounds (preparation and bonding in ClF_3, BrF_5 and IF_7), Xenon compounds- XeF_2, XeF_4, XeF_6 , $XeOF_4$ and XeO_3 (preparation and bonding).

Unit -II : AROMATIC HYDRO CARBONS , ALKYL HALIDES, ARYL HALIDES & ALCOHOLS 10 hrs

Aromatic Hydrocarbons : Preparation of benzene and alkyl benzenes (Aromatization, cyclic polymerization of ethyne, hydrodealkylation, Wurtz-Fittig reaction). General mechanism for electrophilic aromatic substitution, examples of halogenation, nitration, sulphonation and Friedel-Craft alkylation and acylation reaction. Limitations of Friedel Craft's alkylation. Theory of orientation, explanation on the basis of stability of sigma complex using electron withdrawing and electron donating groups (explain with the energy profile diagram). Oxidation of side chain (Benzene with alkyl groups $-CH_3$, $-CH_2CH_2CH_3$ and 1,4- dimethyl benzene)

Alkyl and Aryl halides : Alkyl Halides: Relative reactivities of halogen in alkyl halides, vinyl halides, allyl halides, aryl halides and aralkyl halides. Nucleophilic substitution reactions : S_N1 and S_N2 reactions and their mechanisms, stereochemistry and comparison. S_N i reaction and mechanism.

Aryl-halides: Synthesis of aryl halide from phenols, Sandmeyer's reaction, Gattermann reaction, Raschig-Hooker process and Balz-Schiemann reaction. Aromatic Nucleophilic Substitution reactions : S_NAr, S_N1 and via Benzyne intermediate along with mechanisms.

Effect of nitro substitution on aromatic nucleophilic substitution reactions.

Alcohols : Synthesis of primary, secondary and tertiary alcohols using Grignard reagent, ester hydrolysis.Reduction of aldehydes and ketones, carboxylic acids and esters. Reactions of alcohols with halo acids, esterification reaction and oxidation of alcohols with PCC, $KMnO_4$, Conc. HNO_3 and dichromate salt and Oppenauer oxidation.

Diols : Oxidation of diols, Mechanism of Pinacol-Pinacolone rearrangement.

Unit- III : Thermodynamics I, Distribution Law and Surface Chemical **14 hrs**

Thermodynamics I: Thermodynamic processes, heat, work and internal energy, first law of thermodynamics. Concept of enthalpy, derivation of work done in isothermal and adiabatic expansion (T- V and P-V relationships) of an ideal gas for reversible and irreversible processes, numerical problems, Joule-Thomson effect and its derivation. Joule-Thomson co- efficient and its derivation. Effect of temperature on enthalpy of reaction (Kirchhoff's equation).

Distribution law : Nernst distribution law and thermodynamic derivation of partition co-efficient. Distribution law for changes in molecular state. (association and dissociation). Applications in solvent extraction- simple and multiple extractions. Derivation for multiple extractions, numerical problems.

Chemical and Ionic Equilibria : Law of chemical equilibrium and its thermodynamic derivation. Factors affecting equilibria (Le-Chatelier's principle). Relations between Kp, Kc and Kx for reactions involving ideal gases. Ionization of acids and bases, hydrolysis of three types of salts and derivation for determination of pH of their solutions. Numerical problems. Common ion effect, solubility and solubility product of sparingly soluble salts.

Unit - IV : INDUSTRIAL CHEMISTRY-I **14 hrs**

Chemical Fuels : Review of energy sources (renewable and non-renewable), Classification of fuels. Calorific value- gross calorific values (GCV) and net calorific values (NCV). Characteristics of good Fuel. Determination of gross calorific values (GCV) and net calorific values (NCV) of fuel using bomb calorimeter, numerical problems.

Coal : Uses of coal (fuel and non fuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro Gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry : Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass). Knocking and its mechanism, anti knocking agents, Octane number of petrol and Cetane number of Diesel. Petrochemicals

Solar Energy: Introduction, utilization and conversion, Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (n&p types). Photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells.

Refrences :

1. Modern Inorganic Chemistry: R.D.Madan, S.Chand and Co.Ltd, New Delhi, 2019
2. Chemistry of degree students, R.L.Madan, S.Chand and Co.Ltd, New Delhi.
3. Concise Inorganic Chemistry: J. D. Lee, , 5th Edn, New Age International (1996)
4. Basic Inorganic Chemistry, Cotton, F.A., Wilkinson, G. & Gaus, P.L., 3rd Ed., Wiley.
5. University Chemistry Mahan, B.H. 3rd Ed. Narosa (1998).
6. A Guidebook to Mechanism in Organic Chemistry Peter Sykes, Orient Longman, New Delhi (1988).
7. Advanced Organic Chemistry, Bahl, A. & Bahl, B.S., S. Chand publications, 2010.
8. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
9. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
10. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
11. Organic Chemistry- Mehta and Mehta, 2005.
12. Physical Chemistry W.J. Moore:, 1972.
13. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
14. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
15. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
16. Physical Chemistry - Alberty R. A. and Silbey, R. J. John Wiley and sons, 1992.
17. Synthetic Organic Chemistry: Gurudeep R. Chatwal. Himalaya Publishing House – 1990.
18. Industrial Chemistry, Clerk Ranken MJP Publisher.
19. Industrial Chemistry, Vijay Varma, Arjun Publishing House.
20. Industrial Chemistry, B.K.Sharma, 9th Edn. Krishna Prakashan Media (P) Ltd. Meerut (1997-98)
21. Uppal M.M, Jain and Jain. Engineering Chemistry, Khanna Publishers, 35th Edition, 2013.
22. P.C. Jain and Monica Jain, A text Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 12th Edition, 2012.
23. S.S. Dara & Dr. S.S. Umare. -A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
24. R.V. Gadag and Nitthyananda Shetty-A Text Book of Engineering Chemistry, I.K. International Publishing House. 2nd Edition, 2016.

B. Sc III SEMESTER

Lab Course in General Chemistry

Course Code: 116DSC03P **CIA Marks :20**
Teaching Hrs : 52 **SEE Marks : 30**
Instructer per week : 04hr **Credits: 2**

Course Content :

Course objectives: This course (116DSC03P) will enable the students to

CO1: Understand solubility, solubility product, common ion effect, their applications. Physico-chemical principles of separation of cations into groups in qualitative analysis of inorganic salts

CO2: Develop the skill to perform Semi-microqualitative analysis of mixtures of two simple inorganic salts containing two anions and two cations.

CO3: Able to write the chemical reactions involved in the analysis.

CO4: Determine the percentage of chlorine in bleaching powder, calcium in CAN fertilizer/dolomite ore by complexometric method, copper in brass by iodometric method/ calcium in cement by oxalate method.

INORGANIC CHEMISTRY EXPERIMENTS

Explanation of solubility, solubility product, common ion effect and their applications in separation of cations into groups in qualitative analysis of inorganic salts (students should write in the journal regarding the above).

Experiments 1 to 8 :

Systematic semi-micro qualitative analysis of mixtures of two simple inorganic salts containing two anions and two cations.

Anions: CO_3^{2-}, Cl^-, Br^-, NO_3^-, SO_4^{2-}, $C_2O_4^{2-}$ and BO_3^{3-}

Cations: Cu^{2+}, Al^{3+}, Fe^{2+}, Mn^{2+}, Ni^{2+}, Zn^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, Na^+, K^+ and NH_4^+.

Note: Student has to write ionic reactions for group test and CT for anions and cations

Distribution of marks

Preliminary tests and presentation - 03 marks ,

Anions (group test + C.T + ionic reactions) (1+1+1) x 2=6 marks,

Cations (group test + C.T+ ionic reactions) (1+2+1) x 2=8 marks,

Journal-3 marks, Viva-Voce-5 marks, Total=25 marks.

INDUSTRIAL CHEMISTRY EXPERIMENTS :

Experiment No 9 to 12 :

9. Determination of copper in brass by iodometric method (two samples) / calcium in cement(in duplicate) by oxalate method
10. Determination of iron in haematite ore (in duplicate) by reduction method (SnCl2) using K2Cr2O7 solution
11. Determination of calcium in CAN fertilizer (two samples) /dolomite ore (in duplicate) by complexometric method
12. Determination of percentage of available chlorine in bleaching powder (two samples).

Part-1 : Distribution of Marks

a.	Accuracy :	(06+06) Marks
b.	Technique and presentation :	02Marks
c.	Reactions and Calculations:	03 Marks
d.	Viva :	05 Marks
e.	Journal :	03 Marks
	Total	**=25 marks**

Deduction of marks for accuracy:

± 0.4 CC -06 marks,
± 0.6 CC- 04 marks,
± 0.8 CC- 02 marks,
± 1.0 CC- above 1.0 CC - 01 marks

General instructions: In the practical examination, in a batch of ten students, five students each will be performing inorganic and organic experiments. Selection of experiments may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. Manual is not allowed in the Examination.

Reference Books

1. Vogel's Qualitative Inorganic Analysis, G.Svehla, 7th Ed, Longman (2001).
2. Advanced Practical Chemistry, agadamba Singh, R.K.P. Singh, Jaya Singh, L.D.S.Yadav, I.R. Siddiqui, Pragati prakashan, 7th edition, 2017.
3. College Practical Chemistry: V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati. University Press-2011.
4. Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
5. Comprehensive Practical Organic Chemistry: V K Ahluwalia, and Renu Aggarwal, University Press-2000.

B.Sc. SEMESTER - III
GENERAL CHEMISTRY (SBC)

Course Code: 116SBC03T **CIA Marks :20**
Teaching Hrs : 30 **SEE Marks :30**
Instruction per week : 04hrs **Credit : 2**

Isolation, Determination and Purification of Chemical Compounds

1) Determination of R_f values and identification of organic compounds.
2) Preparation and separation of 2,4-dinitrophenyl hydrazones of acetone, 2-butanone, hexan-2- and -3- one using toluene and light petroleum (40:60)
3) Separation of a mixture of organic compounds using cyclohexane and ethyl acetate.
4) Concept of pH and preparation of Buffer Solutions (acetate buffers)
5) Extraction of caffeine and its colorimetric determination
6) Separation and identification of monosaccharides present in the given mixture by paper chromatography.
7) Colorimetric determination of copper ions in solutions.
8) Qualitative test of Biomolecules: Carbohydrates / Lipids / Amino acids & proteins
9) Paper Chromatographic separation of Fe^{3+}, Al^{3+} and Cr^{3+} ions.
10) Purification of organic compounds by:
    a) Distillation
    b) Steam distillation
    c) Fractional distillation
    d) Recrystallization
11) Colorimetric determination of nitrate in water samples
12) Determination of acetic acid in Vinegar using NaOH

* Industrial Visit (Field survey of local / regional industry).

B.Sc. SEMESTER - III

INDUSTRIAL & ENVIRONMENTAL CHEMISTRY (OEC)

Course Code: 116OEC03T **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Instruction per week : 03hrs **Credit : 2**

Course objectives: This course (116OEC03T) will enable the students to

CO1: Discuss the principles of metallurgical process, alloy preparation and applications

CO2: Analyze the process of manufacturing of glass, ceramics, cement, carbon materials and applications of batteries in the present scenarios

CO3: Assess the environmental standards and interpret control measures of environmental pollution

Course Content :

Unit -I : METALLURGY & ALLOYS **14hrs**

Metallurgy: Minerals, ores, steps in metallurgy (crushing, concentration, calcination, roasting, smelting/reduction, refining), Extraction of titanium from ilmenite, chromium from chromite, nickel by Mond's process and uranium from pitchblende. Powder metallurgy-preparation, uses and advantages.

Alloys- Purpose of making alloys, preparation of alloys. Alloy steels-(ferrous alloys) specific effect of alloying elements, applications of alloy steels. Non- Ferrous alloys: composition, characteristics and uses of copper, nickel, zinc and aluminum alloys.

Unit II: GLASS, CERAMICS, CEMENT, PROTECTIVE COATINGS & BATTERY 14 hrs

Glass and Ceramics : General properties, silicate and non silicate glasses, raw materials used, manufacture, types of glass and their applications. Types and manufacture, high- technology ceramics and their applications, super conducting and semi-conducting oxides.

Cement : Classification with properties of cement, raw materials used in the manufacture of cement and their functions. Manufacture of Portland cement, chemical composition of cement, setting and hardening of Portland cement. RCC and quick setting cements.

Carbon materials : Fullerenes, carbon nanotubes and their applications.

Protective Coatings: Metallic coating, electroplating of nickel and chromium.

Battery: Primary and secondary batteries, battery components and their role. Characteristics of battery. Working of Lead-acid battery, Lithium battery, solid-state electrolyte battery, fuel cells and solar cells.

Unit III: ENERGY AND ENVIRONMENT, AIR, WATER & NUCLEAR POLLUTION AND WATER QUALITY STANDARDS **07 hrs**

Energy and Environment : Sources of energy: coal, petrol and natural gas. Nuclear fusion/ fission, solar energy, hydrogen and geo-thermal energy.

Air pollution : Major regions of atmosphere, chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature. Control measures of air pollution. Photochemical smog: its constituents and photochemistry. green house effect, global warming and ozone depletion.

Water pollution, water quality standards : Water pollutants and their sources. Industrial effluents and their treatment (primary and secondary treatment). Sludge disposal. Water quality parameters for waste water, industrial water and domestic water.

Nuclear pollution: Disposal of nuclear waste, nuclear disaster and its management.

Reference Books:

1. Environmental Chemistry, A. K. De, 6th Edn. New Age International (P) Ltd.,(2008).
2. Environmental Chemistry-S. K. Banerji, (Prentice Hall India), 1993
3. Industrial Chemistry, B.K.Sharma, 9th Edn. Krishna Prakashan Media (P) Ltd. Meerut (1997-98)
4. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Organic Chemistry Morrison, R.T. & Boyd, R.N., Pearson, 2010.
7. Advanced Organic Chemistry Bahl, A. & Bahl, B.S., S. Chand, 2010.
8. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
9. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
10. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
11. Organic Chemistry- Mehta and Mehta, 2005.

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions: 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions: 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions:30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total : 60 marks

Details of Formative Assessment (IA) for DSC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	--	--
Total	40% of the maximum marks allotted for the Paper		

DEPARTMENT OF CHEMISTRY
B.Sc. SEMESTER - IV
GENERAL CHEMISTRY - IV

Course Code: 116DSC04T **CIA Marks :40**
Teaching Hrs : 56 **SEE Marks :60**
Instruction per week : 04hrs **Credit : 2**

Course objectives: This course (116DSC04T) will enable the students to

CO1: Explain general characteristics and properties of d and f block elements and inorganic polymers

CO2: Describe methods of preparation and reactivity of phenols, ethers and carbonyl compounds.

CO3: Discuss the thermodynamic aspects, entropy and free energy functions and adsorption.

CO4: Classify the various corrosion process and protection methods

Course Content :

Unit -I : CHEMISTRY OF d- & f- BLOCK ELEMENTS, INORGANIC POLYMERS AND THEORIES OF ACIDS AND BASES **14hrs**

Chemistry of d- and f- block elements: General characteristics with reference to electronic configuration, colors, variable oxidation states, magnetic, catalytic properties and ability to form complexes. General characteristics of f-block elements with reference to electronic configuration, oxidation states, colors and magnetic properties. Lanthanide contraction and its consequences. Separation of lanthanoids by ion-exchange method. Preparation of trans-uranic elements (up to Z=103).

Inorganic Polymers: General properties and types of inorganic polymers.
Comparison with organic polymers. Silicones: Classifications, preparation, properties, uses and structure. Phosphazines: Preparation, properties, uses and structure.

Modern concepts of acids and bases, Bronsted-Lowry concept, Lux-Flood concept, Lewis concept and Usanvich-Sandvich concept and their limitations. HSAB concept and its applications.

Unit II : PHENOLS, ETHERS & CARBONYL COMPOUNDS **14 hrs**

Phenols : Acidic character, comparative acid strengths of alcohols and phenols, Kolbe's reaction, Claisen rearrangement, Fries rearrangement, Ledrer-Mannase reaction, Reimer-Tiemann reaction. Houben–Hoesch reaction, Schotten – Baumann Reaction. (Mechanism to be discussed for all named reactions)

Ethers : Preparation of ethers, mechanism of Williamson's ether synthesis, mechanism of synthesis of ethers by inter and intra molecular dehydration of alcohols. Reaction of ethers-mechanism of ether cleavage by strong acids. **Epoxides:** Synthesis from alkenes using peroxides, acid and base catalyzed ring opening of epoxides with mechanism and polyether formation. Crown Ethers: Formation and properties (PhaseTransfer Catalyst).

Carbonyl Compounds: Structure of carbonyl compounds, synthesis of aldehydes and ketones by oxidation of alcohols, aldehydes by reduction of acyl chloride, esters, nitriles and ketones from Gillmann's reagent. General mechanism of nucleophilic addition to the carbonyl compounds, mechanism of addition of hydrogen cyanide and hydroxyl amine, addition of alcohol, amines and phosphorus ylids. Acidity of a-hydrogens, mechanism of aldol condensation,

crossed aldol condensation, Perkin's reaction, Claisen's condensation, Dieckman condensation and Darzen's condensation. Reactions of compounds with no a- hydrogens -mechanism of Benzoin condensation and Cannizaro's reaction, crossed Cannizaro's reaction. Reduction of carbonyl groups via Wolf-Kishner reduction and Meerwein-Pondorff Verley reduction.

Unit III: THERMODYNAMICS-II & SURFACE CHEMISTRY **14 hrs**

Thermodynamics II: Concept of entropy and its physical significance, thermodynamic scale of temperature, statements of second law of thermodynamics, molecular and statistical interpretation of entropy, calculation of entropy change for reversible and irreversible processes.

Free energy functions : Gibbs and Helmholtz energy, variation of S, G, A with T, V and P. Gibbs-Helmholtz equation, free energy change and spontaneity. Numerical problems. Statement of third law concept of residual entropy, calculation of absolute entropy of molecules.

Surface chemistry : Adsorption: Types of adsorption isotherms, Freundlich adsorption isotherm (only equation), its limitations. Langmuir adsorption isotherm and its derivation. BET equation and its derivation, numerical problems. Catalysis: Types of catalysis and their theories with examples. Theory of acid-base catalysis, Michaelis- Menten mechanism. Heterogeneous catalysis (unimolecular and bimolecular surface reactions). Applications of heterogeneous catalysts. Autocatalysis with examples.

Unit IV : INDUSTRIAL CHEMISTRY -II **14 hrs**

CORROSION : Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature.

Types of Corrosion - Differential metal, differential aeration (Pitting and water line) and stress Corrosion

PROTECTIVE COATINGS:

Introduction, Technological importance.

Corrosion control: Inorganic coatings- Anodizing of Al and phosphating; Metal coatings- Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

Electroplating : Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives-brighteners, levellers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium(decorative and hard).

Electro less plating : Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

Paints - ingredients and their functions Required Properties of a Paint Paint Constituents and Their Functions - Manufacture of Paint. Types of Pigments - Characteristics of pigment - Oils - Uses in Paint Emulsion Paints – Special Paints - Paint Remover Varnishes

Reference Books:

1. Concise Inorganic Chemistry-J. D. Lee, 5th Edn, New Age International (1996)
2. Modern Inorganic Chemistry Sathya Prakash's by R.D.Madan, S.Chand and Co.Ltd, New Delhi.
3. Inorganic Chemistry-Principles of Structure and Reactivity, 4thEdn-J. E. Huheey, E.A. Keiter, R. L.Keiter and O.K. Medhi. Pearson Education (2009).
4. A Guidebook to Mechanism in Organic Chemistry Sykes, P., Orient Longman, New Delhi(1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Organic Chemistry Morrison, R.T. & Boyd, R.N., Pearson, 2010.
7. Advanced Organic Chemistry Bahl, A. & Bahl, B.S., S. Chand, 2010.
8. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
9. Organic Chemistry- Mehta and Mehta, 2005.
10. Physical Chemistry P.W. Atkins:, 2002.
11. Physical Chemistry W.J. Moore:, 1972.
12. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
13. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
14. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co.1987.
15. Industrial Chemistry, Clerk Ranken MJP Publisher.
16. Industrial Chemistry, Dr. Vijay Varma, Arjun Publishing House.
17. Industrial Chemistry, B.K.Sharma, 9th Edn. Krishna Prakashan Media (P) Ltd. Meerut (1997- 98)
18. Uppal M.M, Jain and Jain. Engineering Chemistry, Khanna Publishers, 35th Edition, 2013.
19. P.C. Jain and Monica Jain, A text Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 12th Edition, 2012.
20. S.S. Dara & Dr. S.S. Umare. -A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
21. R.V. Gadag and Nitthyananda Shetty-A Text Book of Engineering Chemistry, I.K. International Publishing House. 2nd Edition, 2016.

B.Sc. SEMESTER - IV

Lab Course in General Chemistry – IV

Course Code: 116DSC04P **CIA Marks :20**

Teaching Hrs : 52 **SEE Marks : 30**

Instructer per week : 04hr **Credits: 2**

Course Content :

Course objectives: This course (116DSC04P) will enable the students to

CO1: Study the preparation and mechanism of reactions, recrystallization, determination of melting point and calculation of quantitative yields.

CO2: Prepare the organic compound with bromination, nitration, acetylaton, hydrolysis oxidation and reduction

CO3: Explain regarding errors, types of errors, accuracy, precision, significant figures, standard deviation, and Use of log table

CO4: Interpret the principle and theory involved in the industrial chemistry experiments.

Unit - I : Organic Chemistry Experiments

Experiments 1 to 7 :

Preparation of organic compounds :

1. Acetylaton-Synthesis of acetanilide from aniline using Zn Dust/AcOH. (Green method)
2. Bromination – Acetanilide to p-bromo acetanilide.
3. Nitration – Acetanilide to p-nitro acetanilide.
4. Hydrolysis - Benzamide to benzoic acid.
5. Oxidation – Benzaldehyde to benzoic acid.
6. Reduction – m-dinitrobenzene to m- nitro aniline.
7. Preparation of benzophenone oxime.

Distribution of marks

Reaction & Mechanism-05 marks,
Calculation of theoretical yield – 03 mark,
Observed yield -10 marks,
M.P- 03 marks,
Journal – 04 marks,
Viva-Voce-05 marks, (Total=30 marks.)

Deduction of marks for observed yield:

Less than 10% - 10 marks,
11-15% - 8 marks,
16- 20% - 6 marks,
21-25 % - 4 marks &
above 25% - zero mark.

Physical Chemistry Experiments

Explanation regarding errors, types of errors, accuracy, precision, significant figures, standard deviation, and Use of log table (students should write in the journal regarding the above).

8. Study the effect of acid strength of HCl and H_2SO_4 on hydrolysis of methyl acetate.
9. Study the effect of concentration on velocity constant of second order reaction: $KI + K_2S_2O_8$ (a = b).
10. Study the adsorption of acetic acid on animal charcoal (Freundlich adsorption isotherm).
11. Study the distribution of acetic acid/ benzoic acid between water and toluene.
12. Determination of enthalpy of ionization of acetic acid/enthalpy of solution of KNO_3 by calorimetric method.

Distribution of Marks

Accuracy-	12 marks,
Technique and Presentation	-4 marks
Calculation and graph	- 5 marks,
Journal	-4 marks,
Viva-Voce	-5 marks,
Total =	30 marks.

Deduction of Marks for accuracy:

Error up to 5% - 12 marks,

6 - 10% - 10 marks,

11-15% - 08 marks,

16-20% - 06 marks, above

20% - zero (0) marks

General instructions: In the practical examination, in a batch of ten students, five students each will be performing Industrial and physical experiments. . Selection of experiments may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. Manual is not allowed in the examination.

Reference Books

1. Vogel's Qualitative Inorganic Analysis, G.Svehla, 7th Ed, Longman (2001).
2. Advanced Practical Chemistry, agadamba Singh, R.K.P. Singh, Jaya Singh, L.D.S.Yadav, I.R. Siddiqui, Pragati prakashan, 7th edition, 2017.
3. College Practical Chemistry: V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati. University Press-2011.
4. Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
5. Comprehensive Practical Organic Chemistry: V K Ahluwalia, and Renu Aggarwal, University Press-2000.

B.Sc. SEMESTER - IV
ANALYTICAL CHEMISTRY

Course Code: 116OEC04T **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Instruction per week : 03hrs **Credit : 2**

Course objectives: This course (116OEC04T) will enable the students to

CO1: Distinguish between the principle, classification of volumetric analysis and different methods of expression of concentration term, titration curves of all type of acid-base titrations.

CO2: Analyze the composition of soil, water and food products.

CO3: Acquaint with identification and separation of elements through chromatographic techniques.

Course Content :

Unit -I : VOLUMETRIC AND GRAVIMETRIC ANALYSIS 14hrs

Titrimetric analysis: Principle, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/solutions using $N_1V_1 = N_2V_2$, preparation of ppm level solutions from source materials (salts).

Acid-base titrimetry: Theory, titration curves for all types of acids – base titrations. Redox titrimetry: Theory, balancing redox equations, titration curves, theory of redox indicators and applications.

Precipitation titrimetry : Theory, titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.

Complexometric titrimetry : Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations - theory of metal ion indicators.

Gravimetric analysis : Steps involved in gravimetric analysis, requisites of precipitation, factors influencing precipitation, co-precipitation and post precipitation. Advantages of organic reagents over inorganic reagents. Determination of Barium and Iron gravimetrically.

Unit II : ANALYSIS OF SOIL, WATER AND FOOD PRODUCTS 14 hrs

Analysis of soil : Composition of soil, Concept of pH and pH measurement. Determination of pH of soil samples. Estimation o f Calcium a n d Magnesium by complexometric titration

Analysis of water : Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods (reverse osmosis, electro dialysis, ionic exchange). Determination of pH, hardness, TDS and alkalinity of a water sample. Determination of dissolved oxygen (DO) and COD of a water sample.

Analysis of food products : Nutritional value of food, idea about food processing and food preservation and adulteration.

Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, edible oils etc. Analysis of preservatives and colouring matter

Unit III : SEPERATION METHODS **14 hrs**

Chromatography : Definition, general introduction on principles of chromatography, classification, selection of stationary and mobile phases. Paper chromatography: principle and applications (separation of mixture of metal ions (Fe^{3+} and Al^{3+}).

Thin layer chromatography: principle, advantages over other methods, methodology and applications (To compare paint samples by TLC method).

Gas chromatography and High Performance Liquid Chromatography: Principles and applications.

Ion-exchange : Column, ion-exchange chromatography. Resins, types with examples, mechanism of cation and anion exchange processes and applications of ion- exchange chromatography in softening of hard water, separation of lanthanides and industrial applications.

Solvent extraction : Types, batch, continuous, efficiency, selectivity, distribution co efficient, Nernst distribution law, derivation, factors affecting the partition, relationship between percent extraction and volume fraction . Solvent extraction of iron and copper.

Reference Books:

1. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, Saunders College Publishing, New York (2005).
2. Instrumental methods of chemical Analysis, B.K. Sharma, Goel Publishing House, Meerut,
3. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, Pearson Education Pvt.Ltd.(2007).
4. Laboratory manual for Environmental Chemistry: Sunita Hooda and Sumanjeet Kaur by S. Chand & Company 1999.
5. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
6. Fundamentals of soil science, Foth, H.D. Wiley Books. .
7. Handbook of Agricultural Sciences, S.S. Singh, P. Gupta, A. K. Gupta, Kalyani Publication.
8. Introduction to soil laboratory manual - J. J. Harsett Stipes.
9. S.S. Dara & Dr. S.S. Umare. -A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
10. R.V. Gadag and Nitthyananda Shetty-A Text Book of Engineering Chemistry, I.K. International Publishing House. 2nd Edition, 2016.

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions: 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions: 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions:30 marks

   (Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total : 60 marks

Details of Formative Assessment (IA) for DSC theory/OEC: 40% weight age for total marks

Type of Assessment	**Weight age**	**Duration**	**Commencement**
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	--	--
Total	40% of the maximum marks allotted for the Paper		

DEPARTMENT OF MATHEMATICS
SEMESTER-III
ORDINARY DIFFERENTIAL EQUATIONS AND REAL

Course Code: 117DSC03T **CIA Marks :40**
Teaching Hrs : 60 **SEE Marks :60**
Scheme : 4:0:0 **Credit : 04**

Course Objectives: The course will enable the students to

1. Solve first-order non-linear differential equations and linear differential equations.
2. Apply these techniques to solve and analyze various mathematical models.
3. Learn the concept of Convergence and Divergence of a sequence.
4. Able to handle and understand limits and their use in sequences, series, differentiation, and integration.

Course Outcome: Students will able to

117DSC03T.1.- Apply the techniques to solve and analyze various first-order non-linear differential equations and linear differential equations

117DSC03T.2.- Apply Model problems in nature using Ordinary Differential Equations and to Formulate differential equations for various mathematical models

117DSC03T.3 - Apply standard Properties of normal subgroup, Fundamental theorem of homomorphism and Cayley's theorem.

117DSC03T.4.- Solve second and higher order linear differential equations modelled for certain physical situations.

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117DSC03T.1	2	1	-	1	-	-	-	-	-	-	2	1	1
117DSC03T.2	2	1	-	1	-	-	-	-	-	-	2	1	1
117DSC03T.3	2	1	-	1	-	-	-	-	-	-	1	1	1
117DSC03T.4	3	1	-	2	-	-	-	-	-	-	2	1	1

Cource Content

Ordinary Differential Equations

Module I: Recapitulation of Differential Equations of first order and first degree, Exact Differential equations, Necessary and sufficient condition for the equations to be exact, Reducible to the exact differential equations. Differential equations of the first order and higher degree: Equations solvable for p, x, y. Clairaut's equation and singular solution. Orthogonal trajectories of Cartesian and polar curves. **15 Hrs**

Module II: Linear differential equations of the nth order with constant coefficients. Particular Integrals when the RHS is of the form e^{ax}, sin(ax+b), cos(ax+b), x^n, e^{ax} V and x V (with proofs), where V is a function of x. Cauchy – Euler equations, Legendre differential equations, Method of variation of parameters.Simultaneous differential equations with two and more than two variables. Condition for integrability of total differential equations P dx +Q dy+ R dz=0. **15 Hrs**

Real Analysis – I :

Module III : Sequences: Sequences of real numbers, Bounded sequences. Limit of a sequence. convergent, divergent, and oscillatory sequences. Monotonic sequences. Algebra of convergent sequences. Limit points of a sequence. Bolzano Weierstrass theorem for sequence. Limit superior and limit inferior of sequences. Cauchy's first and second theorem on limits of a sequence. Cauchy's general principle for convergence of a sequence. Subsequence and their properties. **15 Hrs**

Module IV : Infinite Series: Definition of convergent, divergent and oscillatory series. Series of non-negative terms, Cauchy's general principle of convergence. Geometric series, P-series (Harmonic series). Comparison tests for positive term series. D'Alembert's ratio test, Raabe's test. Cauchy's Root test and Cauchy's integral test. Alternating series. Leibnitz's theorem. Absolute convergence and conditional convergence of a series. Summation of series: Binomial, exponential and logarithmic. **15 Hrs**

MODEL QUESTION PAPER (Theory)

Duration Hours : 2.hr 30min **Marks : 60**

Instructions: 1. Answer all the questions.

a.	Define/Solve any FIVE of the following (Out of 8)	4 x 2 =08
b.	Solve any SIX of the following (Out of 8)	4 x 5 =20
c.	Solve any THREE of the following (Out of 8)	4 x 8 =32

Reference Books:

1. M.D.Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
2. J. Sinha Roy and S Padhy: A course of Ordinary and Partial Differential Equation, Kalyani Publishers, New Delhi.
3. D. Murray, Introductory Course in Differential Equations, Orient Longman (India)
4. W. T. Reid, Ordinary Differential Equations, John Wiley, New Delhi.
5. M.L. Khanna, Differential Equations, Jai PrakashNath& Co. Meerut.
6. S. L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
7. R.G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 3rd Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2015.
8. Gerald G. Bilodeau, Paul R. Thie, G.E. Keough, An Introduction to Analysis, 2nd Ed., Jones & Bartlett, 2010.
9. K. A.Ross, Elementary Analysis: The Theory of Calculus (2nd edition), Springer, 2013
10. S.K. Berberian, A First Course in Real Analysis, Springer Verlag, New York, 1994.
11. T. Apostol, Mathematical Analysis, Narosa Publishing House
12. M.L Khanna and L.S. Varhiney, Real Analysis by, Jai PrakashNath& Co. Meerut.
13. Kreyzig, Advanced Engineering Mathematics, John Wiley, New Delhi.

Sl.No.	Title	Teaching Hr	Marks Per Unit	2 Marks	5 Marks	10 Marks
1.	Module I	15	30	02	02	02
2.	Module II	15	30	02	02	02
3.	Module III	15	30	02	02	02
4.	Module IV	15	30	02	02	02
	Total	**60**	**120**	**08**	**08**	**08**

SEMESTER-III

ORDINARY DIFFERENTIAL EQUATIONS AND REAL ANALYSIS – I

Course Code: 117DSC03P **CIA Marks :25**
Teaching Hrs : 52 **SEE Marks :30**
Scheme : 0:0:2 **Credit : 02**

Course Objectives: The course will enable the students to

1. Finding complementary function and particular integral of linear and homogeneous differential equations.
2. Plotting orthogonal trajectories
3. Verification of convergence/divergence of different types of functions

Course Outcome: Students will able to

117DSC03P.1- Evaluate the complementary function and particular integral of constant coefficients.
117DSC03P.2- Verification of convergence/ divergences of sequences and infinite series of real numbers by using maxima/scilab program.
117DSC03P.3- Verification of convergence/divergence of different types of series

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117DSC03P.1	2	1	2	1	2	1	-	-	-	1	2	1	1
117DSC03P.2	2	1	2	1	2	1	-	-	-	1	2	2	2
117DSC03P.3	2	1	2	1	2	1	-	-	-	1	2	1	1

Course content:

List of Programs:

Introduction to the software and commands related to the topic.
Use open-source software to executive the practical problems. (Maxima/ Scilab/MatLab/ Mathematica/Python

1. Fundamentals of Ordinary differential equations and Real analysis using FOSS
2. Verification of exactness of a differential equation
3. Plot orthogonal trajectories for Cartesian and polar curves
4. Solutions of differential equations that are solvable for x, y, p.
5. To find the singular solution by using Clairaut's form.
6. Finding the Complementary Function and Particular Integral of linear and homogeneous differential equations with constant coefficients and plot the solutions.
7. Finding the Particular Integral of differential equations up to second order and plot the solutions.
8. Solutions to the Total and Simultaneous differential equations and plot the solutions.
9. Test the convergence of sequences

10. Verification of exponential, logarithm and binomial series.
11. Verification of geometric series, p-series, Cauchy's Integral test, root test, and DAlembert's Test
12. Examples on a series of positive terms.
13. Examples on alternating series using Leibnitz's theorem.
14. Finding the convergence of series using Cauchy's criterion for partial sums.

Scheme for practical examination

- Write program : 10 marks
- Program execution : 10 marks
- Journal : 05 marks
- Viva : 05 marks

30 marks

Reference Books:

1. Scilab by example : M. Affouf 2012, ISBN:978-1479203444
2. Scilab (AfreesoftwaretoMatlab): H. Ramchandran, A.S.Nair.2011 S.Chandand Company
3. Scilabforverybeginners.-www.scilab-enterprises.com
4. M. Kanagasabapathy, Introduction to Maxima for Scientific Computers, BPB Publishers.
5. Kalyanarao Takale, Computational Mathematics using Maxima Software, Nirali Publishers.
6. Vaisak Vena, Maxima, The Computer Algebra System, Notion Press.
7. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
8. J. Sinha Roy and S. Padhy: Acourse of Ordinaryand Partial Differential Equation, Kalyani Publishers, Ne wDelhi.
9. D.Murray, Introductory Course in Differential Equations, Orient Longman (India)
10. W. T.Reid, Ordinary Differential Equations, JohnWiley, New Delhi.
11. M. L Khannaand L.S.Varhiney, Real Analysis, Jai Prakash Nath & Co.Meerut.
12. M. L. Khanna, Differential Equations, Jai Prakash Nath & Co.Meerut

SEMESTER-III
QUANTITATIVE MATHEMATICS

Course Code: 117OEC03T **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Scheme : 3:0:0 **Credit : 03**

Course Objectives: The course will enable the students to

1. Understand number system and fundamental operations
2. Understand the concept of linear quadratic and simultaneous equations and their applications in real life problems
3. Solve the problems based on Age.
4. Solve Speed and Distance related problems.

Course Outcome: Students will able to

117OEC03T.1: Understand number system and fundamental operations

117OEC03T.2: Understand the concept of linear quadratic and simultaneous equations.

117OEC03T.3: Understand and solve the problems based on Age.

117OEC03T.4: Solve Speed and Distance related problems.

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117OEC03T.1	2	1	2	1	2	1	-	-	-	1	2	1	1
117OEC03T.2	2	1	2	1	2	1	-	-	-	1	2	2	2
117OEC02T.3	2	1	2	1	2	1	-	-	-	1	2	1	1
117OEC03T.4	3	2	2	2	2	1	-	-	-	1	1	1	1

Cource Content

Model - I : Number System

Numbers, Operations on Numbers, Tests on Divisibility, HCF and LCM of numbers. Decimal Fractions, Simplification, Square roots and Cube roots - Problems there on. Surds and Indices. Illustrations thereom. **14 Hrs**

Module II : Theory of equations

Linear equations, quadratic equations, simultaneous equations in two variables, simple application problems-Problems on Ages, Problems on conditional Age calculations, Present & Past age calculations. **14 Hrs**

Module III : Quantitative Aptitude

Percentage, Average, Average Speed-problems. Timeanddistance, problemsbasedontrains, problems on-work and time, work and wages, clock and calendar. **14 Hrs**

MODEL QUESTION PAPER (Theory)

Duration Hours : 2.hr 30min **Marks : 60**

Instructions: 1. Answer all the questions.

a.	Define/Solve any FOUR of the following (Out of 8)	4 x 2 =08
b.	Solve any FOUR of the following (Out of 8)	4 x 5 =20
c.	Solve any FOUR of the following (Out of 8)	4 x 8 =32

Reference Books:

1. R .S. Aggarwal, Quantitative Aptitude, S. Chan and Company Limited,NewDelhi-110 055 .
2. Abhijit Guha, Quantitative Aptitude,5th Edition, Mc.Grawhill publications.2014.
3. R.V. Praveen, Quantitative Aptitudeand Reasoning, PHI publishers.
4. R. S. Aggarwal, Objective Arithmetic ,S. Chand & Company Ltd.
5. Qazi Zameerddin,Vijay K . Khanna,S K Bhambri, Business Mathematics-II Edition.
6. S. K. Sharma and Gurmeet Kaur, Business Mathematics , Sultan Chand & Sons.
7. Hazarika Padmalochan, A Text Book of Business mathematics for B.Com and BBA Course, Chand Publication.
8. J. K. Thukrol, Business Mathematics, abci book:2020 First Edition.
9. N. G. Das and J. K. Das, Business Mathematics and Statics, Mc Graw Hill Education, 2017

SEMESTER-III

SCILAB

Course Code: 117SBC03 **CIA Marks :20**
Teaching Hrs : 04 **SEE Marks :30**
Scheme : 0:0:2 **Credit : 04**

Course Objectives: The course will enable the students to

1. Understand the Scilab and apply commands in Scilab
2. Make use of looping in Scilab
3. Construct Scilab functions
4. Develop skills to write programme in Scilab

Course Outcome: Students will able to

117SBC01.1: Understand the Scilab and apply commands in Scilab
117SBC01.2: Use looping in Scilab
117SBC01.3: Build Scilab functions
117SBC01.4: Plot graphs
117SBC01.5: Develop skills to write programme in Scilab

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117SBC01.1	2	1	-	2	-	-	-	-	-	-	2	1	2
117SBC01.2	2	1	-	1	-	-	-	-	-	-	1	2	1
117SBC01.3	2	1	-	1	-	-	-	-	-	-	1	2	2
117SBC01.4	3	2	-	2	-	-	-	-	-	-	1	1	1
117SBC01.5	2	1	-	1	-	-	-	-	-	-	1	2	1

Course content:

Module I : Introduction to Scilab, The general environment, The editor, Command Window, graphics window, window management and workspace customization, Variables assignments, display array in terms of matrices and vectors, Displaying output data, data file, Scilab functions. **15hrs**

Module II : Relational and logical operators, Branching Statements and program design, Loops, the while loop, for loop, Tests, 2D and 3D plotting, developing the skills of writing a program Solving differential equations. **15hrs**

Scheme for practical examination

- Write program : 10 marks
- Program execution : 10 marks
- Journal : 05 marks
- Viva : 05 marks

30 marks

Reference Books:

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
2. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company

DEPARTMENT OF MATHEMATICS
SEMESTER-IV
PARTIAL DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS

Course Code: 117DSC04T **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Scheme : 4:0:0 **Credit : 04**

Course Objectives: The course will enable the students to

1. Solve the Partial Differential Equations of the first order and second order .
2. Formulate, classify and transform partial differential equations into canonical form.
3. Offer a gentle introduction to the concepts of Laplace transforms and inverse Laplace transforms.
4. Understand and calculate Fourier series and Fourier tansform.

Course Outcome: Students will able to

117DSC04P.1 : Identify and solve various types of partial differential equations.
117DSC04P.2 : Classify and transform partial differential equations into canonical form.
117DSC04P.3 : Solve integral equations and differential equation using laplace transforms
117DSC04P.4 : Understand and calculate Fourier series and Fourier tansform.

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117DSC04P.1 :	2	1	-	2	-	-	-	-	-	-	2	1	2
117DSC04P.2 :	2	1	-	1	-	-	-	-	-	-	1	2	1
117DSC04P.3 :	2	1	-	1	-	-	-	-	-	-	1	2	2
117DSC04P.4 :	3	2	-	2	-	-	-	-	-	-	1	1	1

Course Content:

Partial Differential Equations :

Module I: Basic concepts–Formation of a partial differential equations by elimination of arbitrary constants and functions, Solution of partial differential equations – Solution by Direct integration, Lagrange's linear equations of the form Pp + Qq = R , Standard types of first order non-linear partial differential equations, The integrals of the non-linear equation by Charpit's method. **15Hrs**

Module II: Homogeneous linear partial differential equations with constant coefficients. Partial differential equations of the second order. Classification of second-order partial differential equations, canonical forms. Classification of second order linear equations as hyperbolic, parabolic, and elliptic. Solutions of the Heat equation, Laplace equation and Wave equation (using separation of variables) **15Hrs**

Integral Transforms :

Module III : Laplace Transforms: Definition, Basic Properties. Laplace transforms of some standard functions. Laplace transform of Periodic functions. Laplace transform of derivative and integral of a function. Heaviside function. Dirac-delta function. Convolution theorem. Inverse Laplace transforms and its properties. Solution of differential equations by using Laplace transforms. **15Hrs**

Module IV : Fourier Series and Transforms: Periodic functions. Fourier Coefficients. Fourier series of functions with period 2π and period 2L. Fourier series of even and odd functions. Half range Cosine and Sine series. Fourier Transforms -Finite Fourier Cosine and Sine transform. Transforms of derivates. Applications of Fourier Transforms. **15hrs**

MODEL QUESTION PAPER

Duration Hours : 2hr 30 min **Instructions:** 1. Answer all the questions. **Marks : 60**

I.	Define/ Write a note on any FIVE of the following (Out of 7)	4 x 2 = 08
II.	Answer / Explain any SIX of the following (Out of 8)	4 x 5 = 20
III.	Answer / Describe in detail any THREE of the following (Out of 5)	4 x 8 = 32

Reference Books:

1. D. A. Murray, Introductory Course in Differential Equations, Orient and Longman
2. H.T. H.Piaggio, Elementary Treatise on Differential Equations and their Applications, CBS Publisher & Distributors, Delhi,1985.
3. G.F.Simmons, Differential Equations, Tata McGraw Hill.
4. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
5. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
6. K.SankaraRao, Introduction to Partial Differential Equations: PHI, Third Edition, 2015.
7. I. N. Sneddean, Elements of Partial differential equations, McGraw-Hill International Editions, 1986.
8. R. Murray and L. Spiegal (Schaum's Series), Laplace Transforms
9. Goel and Gupta, Laplace Transform.
10. Sudhir Kumar, Integral Transform Methods in Science & Engineering, CBS Engineering Series, 2017.
11. Murray R. SpiegalL, Fourier Transforms, Schaum' Series,
12. Earl David Rainville and Philip Edward Bedient–A short course in Differential Equations, Prentice Hall College Div; 6th Edition.
13. Sathya Prakash, Mathematical Physics, S. Chand and Sons, New Delhi.

Sl.No.	Title	Teaching Hr	Marks Per Unit	2 Marks	5 Marks	10 Marks
1.	Module I	15	30	02	02	02
2.	Module II	15	30	02	02	02
3.	Module III	15	30	02	02	02
4.	Module IV	15	30	02	02	02
	Total	**60**	**120**	**08**	**08**	**08**

SEMESTER-IV

PARTIAL DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS

Course Code: 117DSC04P **CIA Marks :20**
Teaching Hrs : 52 **SEE Marks :30**
Scheme : 0:0:2 **Credit : 02**

Course Objectives: The course will enable the students to

1. Solve problems on Partial Differential Equations and Integral Forms
2. Find Laplace transform of various functions and fourier Transform of periodic functions.
3. Solve differential equations by using Integral transforms.

Course Outcome: Students will able to

117DSC04P.1 : Solving Partial Differential Equations using Free and Open Source Software (FOSS) tools.

117DSC04P.2 : Demonstration of Fourier series and Laplace transform examples using Free and Open Source Software (FOSS) tools.

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117DSC4P.1	2	1	-	1	2	-	-	-	-	1	2	1	1
117DSC4P.2	2	1	-	1	2	-	-	-	-	1	2	2	2

Course content:

List of Problems:

Introduction to the software and commands related to the topic.

Programs using Scilab/Maxima/Python:

Elements of Partial differential equations and Integral transforms using FOSS

1. Solutions of Linear Partial differential equations of type1to type 4 and Lagrange's method
2. Solutions of partial differential equation using Charpit's method.
3. Solutions of Second order homogenous partial differential equation with constant coefficients.
4. Solutions to the partial differential equations using separation of variables method (Heat/ Wave/Laplace).
5. Finding the Laplace transforms of some standard and periodic functions.
6. Finding the inverse Laplace transform of simple functions
7. Verification of Convolution Theorem.
8. To solve ordinary linear differential equation using Laplace transform.
9. To solve Integral equation using Laplace transform.
10. To find full range Fourier series of some simple functions with period 2 and 2L
11. To find Half range sine and cosineseries of some simple functions and ploting them.
12. To find Cosine Fourier transforms.
13. To find Sine Fourier transforms.

Scheme for practical examination

- Write program : 10 marks
- Program execution : 10 marks
- Journal : 05 marks
- Viva : 05 marks

30 marks

Reference Books:

1. Scilabbyexample:M.Affouf2012,ISBN:978-1479203444
2. Scilab(AfreesoftwaretoMatlab):H.Ramchandran,A.S.Nair.2011S.ChandandCompany
3. Scilabforverybeginners.-www.scilab-enterprises.com
4. M. Kanagasabapathy, Introduction to Maxima for Scientific Computers, BPB Publishers.
5. Kalyanarao Takale, Computational Mathematics using Maxima Software, Nirali Publishers.
6. Vaisak Vena, Maxima, The Computer Algebra System, Notion Press.
7. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, NewDelhi.
8. J. Sinha Roy and S.Padhy : A course of Ordinary and Partial Differential Equation, Kalyani Publishers, NewDelhi.
9. D. Murray, Introductory Course in Differential Equations, Orient Longman (India)
10. W. T.Reid,OrdinaryDifferentialEquations,JohnWiley, New Delhi.
11. M.L Khanna and L.S.Varhiney ,Real Analysis, Jai Prakash Nath & Co. Meerut.
12. M. L.Khanna,DifferentialEquations,Jai Prakash Nath & Co.Meerut

SEMESTER-IV
MATHEMATICAL FINANCE

Course Code : 117OEC04T **CIA Marks : 40**
Teaching Hrs : 42 **SEE Marks : 60**
Scheme : 3:0:0 **Credit : 03**

Course Objectives: The course will enable the students to

1. Underst and how to compute profit and loss, discount, and Banker's discount.
2. Formulation of Transportation Problem and its application in the routing problem integrate the concept in business concept with the functioning of global trade.
3. Solving Linear Equations by using graphical method.

Course Outcome: Students will able to

117OEC04T.1 : Solving the problems on profit and loss, discount, and Banker's discount .

117OEC04T.2 : Apply the concept of Linear equations and inequalities to solve the Linear Programming Problems .

117OEC04T.3 : Apply knowledge of business concepts and functions in an integrated manner.

Mapping of CO with PO and PSO:

CO.	PO												
	1	2	3	4	5	6	7	8	9	10	PSO-1	PSO-2	PSO-3
117OEC04T.1	2	1	-	2	-	-	-	-	-	-	2	1	2
117OEC04T.2	1	1	-	1	-	-	-	-	-	-	1	1	1
117OEC04T.3	1	2	-	1	-	-	-	-	-	-	2	2	1
117OEC04T.4	3	2	-	2	-	-	-	-	-	-	1	1	1

Course Content:

Module I : Commercial Arithmetic

Bill of exchange, Bill of discounting procedure. Basic formula related to profit, loss, discount and brokerage, Successive discount, True discount, Banker's discount. **14hrs**

Module II : Linear Programming

Linear equations and inequalities - Rectangular coordinates, straight line, parallel and intersecting lines and linear inequalities, Introduction to linear programming, Mathematical formulation of LPP, Solution of a LPP by graphical method, special cases in graphical method. **14hrs**

Module III : Transportation problem

Introduction, Formulation of Transportation problem, Initial basic feasible solution, Steps in solving a transportation problem, optimality check, special cases in Transportation problem. The Travelingsalesman Problem (Routing Problem). **14hrs**

MODEL QUESTION PAPER

Duration Hours : 2hrs 30 min **Marks : 60**

Instructions: 1. Answer all the questions.

a. Define/Solve any Four of the following (Out of 8) 4 x 2 = 08

b. Solve any Four of the following (Out of 8) 4 x 5 = 20

c. Solve any Four of the following (Out of 8) 4 x 8 = 32

Sl.No.	Title	Teaching Hr	Marks Per Unit	2 Marks	5 Marks	10 Marks
1)	Module I	14	30	03	02	03
2)	Module II	14	30	02	04	02
3)	Module III	14	30	03	02	03
	Total	**42**	**120**	**08**	**08**	**08**

DEPARTMENT OF BOTANY
SEMESTER - III
PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY

Course Code: 118DSC-03T **CIA Marks :40**
Teaching Hrs : 60 **SEE Marks :60**
Scheme : 4:0:0 **Credit : 04**

Course Objectives: The course (118DSC-04) will enable the students to

1. Identify plant tissues system
2. Anatomical studies of plant system
3. Reproduction in plants.

Course Outcome: Students will able to

118DSC- 03.T.1-1. Acquaintance of plant tissue system.

118DSC- 03.T.2-2. Skill development for the proper description of internal structure of various parts of plants.

118DSC- 03.T.3-3. To analyse sexual reproduction in flowering plants.

118DSC- 03.T.4-4. To emphasize interest in reproductive methods sub-stages in the life cycle and variations in reproduction of plants.

Mapping of CO with PO and PSO:

CO.	PO													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2
118DSC- 03.T.1	3	2	3	3	2	3	2	3	2	3	3	3	3	2
118DSC- 03.T.2	2	2	3	2	2	3	2	3	2	2	3	3	3	3
118DSC- 03.T.3	2	2	3	3	2	3	2	3	1	3	2	2	3	2
118DSC- 03.T.4	3	2	2	3	3	3	3	3	1	2	3	2	3	2

Course Content:

UNIT- I: PLANT TISSUES AND TISSUE SYSTEM : 14hrs

Introduction, objective and scope of Plant Anatomy.

Meristem: Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre, Root cap.

Tissue and tissue systems - Meristematic tissue, permanent tissue and Tissue system-Dermal, Ground,Vascular System .

Classification of meristem: (apical, intercalary and lateral), primary and secondary meristem.

UNIT-II : PLANT ANATOMY 14 Hrs.

Structure of Dicot root: primary and secondary structures (Tridax/Sunflower), Structure of monocot root (Maize).

Structure of Dicot stem: Primary and secondary structures (Tridax/Sunflower), Structure of Monocot stem (Maize)

Structure of Dicot leaf: primary structure (Tridax/Sunflower), primary structure of Monocot leaf (Maize). Anomalous secondary growth: Bignonia, Boerhaavia (dicot stem) and Dracaena (monocot stem) Applications in systematics, and Pharmacognosy.

UNIT-III: DEVELOPMENTAL BIOLOGY : 14 Hrs.

Introduction, Scope and contributions of Indian embryologists: P. Maheswari, B G L Swamy, P.Maheshwari, M.S. Swaminathan and K.C. Mehta.

Microsporangium: Development and structure of mature anther, Anther wall layers, Tapetum -types, structure and functions and sprogenous tissue.

Microsporogenesis - Microspore mother cells, microspore tetrads, Pollinia.

Palynology : NPC System &Its applications

Microgametogenesis – Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon).

Megasporangium – Structure of typical Angiosperm ovule.Types of ovule- Anatropous, Orthotropous, Amphitropous, Circinotropous.

Megagametogenesis – Types of development of Female gametophyte/embryosac-monosporic- Polygonum type, bisporic – Allium type, tetrasporic - Fritillaria type. Structure of mature embryosac.

UNIT-IV : REPRODUCTIVE BIOLOGY 14 Hrs.

Pollination and fertilization: Structural and functional aspects of pollen, stigma and style. Post pollination events, Pollen Pistil interaction. Current aspects of fertilization and Significance of double fertilization, Post fertilization changes.

Endosperm – Types and its biological importance. Free nuclear (Cocos nucifera) cellular (Cucumis), helobial types. Ruminate endosperm.

Embryogenesis – Structure and composition of zygote, Dicot (Capsella bursa-pastoris)and Monocot (Najas) embryo development.

Polyembryony and **Apomixis**

Seed : Srtucture and Development of monocot and dicot seed A general account of seed development.

Reference Book :

1. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.
2. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.

Sl.	Name of Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	10 Marks
UNIT- I	**Plant Tissues And Tissue System.**	14	30	02	02	02
UNIT-II	**Plant Anatomy**	14	30	02	02	02
UNIT–III	**Developmental Biology**	14	30	02	02	02
UNIT-IV	**Reproductive biology**	14	30	02	02	02
		56 hours	120	16	40	64

SEMESTER - III
PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY (PRACTICAL)

Course Code: 118DSC-03P **CIA Marks :20**
Teaching Hrs : 40 **SEE Marks :30**
Scheme : 0:0:4 **Credit : 02**

Course Objectives: The course (118DSC-03P) will enable the students to

1. Temporary micropreparation of the plants parts (roots, stem, leaf).
2. Determination of Pollen viability
3. Mounting on embryo, endosperm, placentation types.
4. Morphology of pollen grains.

Course Outcome: Students will able to

118DSC- 03.T.1- Identification of simple and complex plant tissues.
118DSC- 03.T.2- Analysis of primary and secondary anatomical structures.
118DSC- 03T.3- Evaluation of pollination and adaptation in flowers.
118DSC- 03.T.4- Inculcation of research attitude in students

Mapping of CO with PO and PSO:

CO.	PO													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2
118DSC- 03.T.1	3	3	2	1	3	3	2	3	3	3	3	3	3	2
118DSC- 03.T.2	2	3	2	2	3	3	2	3	3	3	3	3	3	3
118DSC- 03.T.3	3	3	3	3	2	3	2	3	2	3	3	2	3	2
118DSC- 03.T.4	3	2	3	3	3	3	2	2	3	2	3	2	3	3

Practicals Course Content:

Practical No.1

i) Study of meristem (Permanent slides/ Photographs).
ii) Study of Simple Tissues (Parenchyma, Collenchyma and Sclerenchyma)and Complex Tissues (xylem and phloem).

Practical No.2

Maceration technique to study elements of xylem and phloem, Study of primary structure of dicot root, stem and leaf (Sunflower) and monocot root, stem and leaf (Maize)

Practical No. 3

Study of Normal secondary growth in dicot stem and root (Sunflower) and Anomalous secondary growth: Bignonia, Boerhaavia (dicot stem) Dracaena (monocot stem)

Practical No. 4

Study of trichomes (any three types) and stomata (any three types) with the help of locally available plant materials

Practical No. 5

Permanent slides of Microsporogenesis and male gametophyte Mounting of Pollen grains of Grass and Hibiscus and Pollinia of Calotropis

Practical No. 6

In vitro pollen germination by hanging drop method

Practical No. 7

Permanent slides of types of ovules, Megasporogenesis &embryosac development and types of placentation: Axile, Marginal and Parietal types. Sectioning of ovary, for the studied types of placentation

Practical No. 8

Mounting of embryo endosperm and: Tridax and Cyamopsis, cucumis

Practical No. 9 and 10

Mini project work in groups of 3-5 students, from the following list

a) Study of pollen morphology of different flowers with respect to shape, colour, aperture etc.

b) Pollen germination of different pollen grains and calculates percentage of germination.

c) Calculating percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions.

d) Study of placenta ion of different flowers. e) Any other relevant study related to Anatomy / Embryology.

MODEL QUESTION PAPER

Q. No. I. Make a temporary double stained micro-preparation of the specimen "A" Draw a labeled diagram and show the preparation to the examiner and give reasons **06 M**

Q. No. II. Determine the percentage of pollen viability by Hanging Drop Method. in the given sample "B". **04 M**

Q. No. III. Make a temporary micro preparation of specimen OR the non-living cell inclusion in the specimen "C". So as to expose_____ Show the preparation to examiner. Draw a neat labeled diagram. **03 M**

Q. No. IV. Mount endosperm / embryo from the given material "D". **02 M**

Q. No.V. Identify and comment on the specimen / slides/microphotographs

E,F, G, H & I **2 X5=10 M**

Mini project **02 M**

Journal **03 M**

Scheme of Valuation:

1. Make a double stained micro-preparation of the specimen "A" Draw a labelled diagram and show the preparation to the examiner. 06 M

2. Preparation- 2 Marks

   Diagram- 2 Marks

   Viva- 2 Marks

2. Determine the percentage of pollen viability in the given sample "B". 04 Marks

   Preparation- 2 Marks

   Calculation and Result- 2 Marks

3. Make a temporary micro preparation of specimen "C". So as to expose____ _.Show the preparation to examiner. Draw a neat labeled diagram. 03 Marks
   Preparation - 1 Mark
   Diagram- 1 Mark
   Viva- 1 Marks
4. Mount endosperm / embryo from the given material D". 02 Marks
   Preparation- 1 Mark
   Viva- 1 Mark
5. Identify and comment on the specimen / slides/microphotographs
   E,F, G, H & I
   Tissues- E & F Anatomy- G, Embryology slide- H & I 2 X5=10 Marks
   Mini Project 02 Marks
   Journal 3 Marks.

SEMESTER - III
ALGAL CULTIVATION AND APPLICATIONS

Course Code: 118OEC-03T **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Scheme : 3:0:0 **Credit : 03**

Course Objectives: The course (118OEC-03T) will enable the students to

1. Understand the general account of Blue Green Algae and Algae
2. Describe the Eutrophication
3. Knowledge Algal cultivation.
4. Illustriate uses of algal products

Course Outcome: Students will able to

118OEC-03.T.1 Understand core concepts and fundamentals of algal growth

118OEC-03.T.2- Translate various algal technologies for restoration of ecosystem

118OEC-03.T.3- Know the algal growth in different types of natural water bodies.

118OEC-03.T.4- Analyze emerging areas of Algal Biotechnology for algal products & their commercial applications.

Mapping of CO with PO and PSO:

CO.	PO													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2
118OEC-03.T.1	3	3	2	3	3	3	2	2	2	3	3	3	3	3
118OEC-03.T.2	3	2	2	3	3	3	2	3	1	3	2	3	3	3
118OEC-03.T.3	2	3	2	3	2	3	2	3	1	3	3	3	3	3
118OEC-03.T.4	3	3	3	3	3	3	3	3	3	2	2	3	3	3

Course Content:

UNIT- I: **14hrs**

A brief account of culture techniques and media for algal research. Measurement of algal growth: lag phase, log phase, stationary phase and death phase using biomass, chlorophyll content. Causes and consequences for eutrophication and its impact on marine & fresh water algal blooms. algal blooms.

UNIT-II : **14 Hrs.**

Algal immobilization: methods and applications, Algal technologies for the restoration/ maintenance of soil fertility; reclamation of user soils. Restoration of degraded aquatic systems through algae; High rate algal ponds for the treatment of wastewaters for the production of useful algal biofuels

UNIT-III: **14 Hrs.**

Algal Biotechnology: Single cell proteins, bio-fertilizers, Algae as food, medicine, feed.Industrial products such as phyco-colloid (Agar-agar, Algin, Carrageenan, Diatomite); A brief account of commercial potentials of algal products & theiruses. Algae as indicators of pollution. Biofouling, Sewage disposal.Waste-land reclamation. Use of Algae in experimental studies. Algae in space. Algal toxins.

Reference Book :

1. Hoek, C. and Van D. (2009) Algae: An Introduction to Phycology. Cambridge University Pres
2. Bast, F. (2014). An Illustrated Review on Cultivation and Life History of Agronomically Important Seapl ants. In Seaweed: Mineral Composition, Nutritional and Antioxidant Benefits and Agricultural Uses, Eds. Vitor Hugo Pomin, 39-70. Nova Publishers, New York ISBN:978-1-63117-571-8
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Bast, F. (2014). Seaweeds: Ancestors of land plants with rich diversity. Resonance,19 (2)1032-1043ISSN:0971-8044

Sl.	Name of Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	10 Marks
1.	Algal Culture Tchniques	11	17	01	01/02	01/0
2.	Algal technologies for the restoration.	10	17	01/02	01/02	01/0
3.	Algal Biotechnology	10	17	01/02	01/02	01/0
4.		11	17	01/02	01/02	01/0
		42hrs		**6**	**7**	**4**

SEMESTER - IV
ECOLOGY AND CONSERVATION BIOLOGY

Course Code: DSCBot-404 **CIA Marks :30**
Teaching Hrs : 60 **SEE Marks :70**
Scheme : 4:0:0 **Credit : 04**

Course Objectives: The course will enable the students to

1. Effects of ecological factors on ecosystem
2. Morphological, anatomical and physiological adaptation in plants.
3. Types of ecosystem.
4. Types of vegetation and conservation.

Course Outcome: Students will able to

DSCBot-404.T.1- To emphasize core concepts of biotic and abiotic factors and Plantcommunities
DSCBot-404.T.2- To describe structure, functions and types of ecosystems and plant vegetation
DSCBot-404.T.3- Examine causes, effects and control measures of environmental pollution
DSCBot-404.T.4- Creation of In–situ and Ex situ conservation of Biodiversity

Mapping of CO with PO and PSO:

CO.	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
SEC-BOT-303-T.1	3	3	3	2	1	3	2	3	3	3	3	3	3
SEC-BOT-303-T.2	2	2	3	3	3	3	3	3	3	3	3	3	3
SEC-BOT-303-T.3	3	2	2	3	3	3	3	3	3	2	3	3	3
SEC-BOT-303-T.4	3	3	3	3	3	3	3	3	3	3	3	3	3

Course Content:

UNIT- I - Introduction to Ecology and Conservation Biology: 14 hrs

Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation.

Ecological factors: Climatic factors: light, temperature, precipitation and humidity.

Edaphic factors: Soil and its types, soil texture, soil profile, soil formation; physico-chemical properties of soil – soil nutrients, soil pH, soil aeration, organic matter, soil humus and soil microorganisms.

Topographic Factors.

Ecological groups of plants and their adaptations: Morphological, anatomical and physiological adaptations of hydrophytes, xerophytes, epiphytes and halophytes.

UNIT-II - Ecosystem Ecology: 14hrs

Introduction, Structure and types of ecosystems with examples -terrestrial and aquatic, natural and artificial.

Detail study of a pond ecosystem.

Principles of Energy flow in ecosystem. Ecosystem functions and processes:

Food chain-grazing, detritus, and parasitic, Food web. Ecological pyramids -Pyramids of energy, biomass and number.

Bio-geo chemical cycles: Hydrological cycle-Water cycle. Gaseous cycles - nitrogen, Sedimentary cycle- Phosphorus.

Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere.

UNIT-III : Phytogeography and Environmental Pollution **14hrs**

Theory of land bridge, theory of continental drift, Centre of origin of crop– Vavilov's concept, types. Phytogeographical regions–concept, phytogeographical regions of India.

Vegetation types of Karnataka – Composition and distribution of evergreen, semi-evergreen, deciduous, scrub, mangroves, shoal forests and grasslands.

Pollution: Water pollution: Causes, effect, types; water quality indicators, water quality standards in India, control of water pollution (Waste water treatment).

Air pollution: Causes, effect, air quality standards, acid rain, control.

Soil pollution: Causes, effect, solid waste management, control measures of soil pollution.

UNIT-IV : Biodiversity and its conservation: **14hrs**

Biodiversity: Definition, types of biodiversity - genetic diversity, species diversity, Ecosystem diversity, and biodiversity conservation strategies.

Values of Biodiversity – Economic and aesthetic value, Medicinal and timber yielding plants. NTFP. Threats to biodiversity.

Concept of Biodiversity Hotspots, Biodiversity hot spots of India.

IUCN plant categories with special reference to Karnataka.

Biodiversity Strategies

Conservation methods – In-situ methods –Biosphere reserves, National parks, Sanctuaries, Sacred grooves

Ex-situ methods-Botanical gardens, Seed bank, Gene banks, Pollen banks, Culture collections, Cryopreservation.

Indian forest conservation act, Biodiversity Act(2002).

Reference Book :

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rdedition.
5. Mondal A. K. Advanced Taxonomy
6. Sutaria, Textbook of plant Taxonomy
7. Odum E. P. Text Book of Ecology
8. Shukla and Chandel, Plant Geography

Sl.	Name of Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	08 Marks
1.	Introduction to Ecology and Conservation Biology: Ecological factors: Ecological groups of plantsand their adaptations:	14	30	02	02	02
2.	Ecosystem Ecology:	14	30	02	02	02
3.	Phytogeography and Environmental Pollution	14	30	02	02	02
4.	Biodiversity and its conservation	14	30	02	02	02
	Total	56	120	16	40	64

SEMESTER - IV (Practical)
ECOLOGY AND CONSERVATION BIOLOGY

Course Code: DSCBot-404 (P) **CIA Marks :20**
Teaching Hrs : 40 **SEE Marks :30**
Scheme : 0:0:4 **Credit : 02**

Course Objectives: The course DSCBot-404 (P) will enable the students to

1. To study the environmental factors- Edaphic, Climatic, Biotic and Topographic.
2. To explain the Ecological adaptations-Hydrophytes, Xerophytes, Mesophytes Epiphytes, Halophytes.
3. To learn the Energy flow in Ecosystem & Biogeochemical cycles- Carbon, Nitrogen and Sulphur cycle.

Course Outcome: Students will able to

DSCBot-404.P.1- To estimate on different parameters of various soil and water samples.
DSCBot-404.P.2- To identify and enhance identification skills to measure microclimatic variables
DSCBot-404.P.3- To plan and organize study of herbaceous vegetation
DSCBot-404.P.4 To evaluate different ecological estimations.

Mapping of CO with PO and PSO:

CO.	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSCBot-404.P.1	3	2	-	3	2	3	-	-	-	3	3	3	3
DSCBot-404.P.2	3	3	-	3	3	3	3	2	-	2	3	3	3
DSCBot-404.P.3	3	-	-	3	2	3	2	-	-	2	3	3	3
DSCBot-404.P.4	3	3	3	3	3	3	3	3	-	2	3	3	3

Practical Course Content:

1. Determination of pH of different types of Soils and water samples.
2. Study of Ecological instruments – Wet and Dry thermometer, Altimeter, Hygrometer, Soil thermometer, Rain Gauge, Barometer
3. Hydrophytes: Morphological and anatomical adaptations in Hydrilla, Eichhornia, Typha.
4. Xerophytes: Morphological and anatomical adaptations in Aloe vera, Opuntia, Casuarina.and Nerium
5. Epiphytes: Morphological anatomical adaptations in Vanda.
   Halophytes: study of Vivipary in mangroves, Morphology and anatomy of Pneumatophores.
6. Demonstration of different types of vegetation sampling methods – by quadrate. Determination of Density and frequency.
7. Determination of water holding capacity of soil samples
8. Determination of Biological oxygen demand (BOD) &Dissolved Oxygen (DO)
9. Study of a pond/forest ecosystem and recording the different biotic and abiotic components
10. Field visits to study different types of local vegetations/ecosystems and the report to be written in practical record book.

PRACTICAL QUESTION PAPER

Q.No.1. Write an account of Ecological adaptations found in the Specimen "A" and "B". Mention their habitats. 5 x2 = 10 M

Q.No.2. Estimate / Determine _____ of the Sample "C" and write the conclusion. 03 M

Q.No.3. Identify and comment on the ecological interest found in the Specimen / Slide D, E and F. 3x3= 06

Q.No.4. Identify and comment on the working mechanism involved in the instruments G and H. 2x2=04

TourReport……..... 04

Journal…… 03

Scheme of Valuation :

Q.No.1. Two specimens from ecological adaptations. 2x5 = 10 M

Preparation …….. 02 Marks

Identification…….. 01 Mark

Diagram and Explanation. 02 Marks

Q.No.2. pH of soil/water DO, BOD of water Alkalinity of soil and water. 1x3 = 3 M

Estimation…… 02 Marks

Conclusion …… 01 Marks

Q.No.3. Plant interaction - 2 specimen. 3x2 = 06 M

Ecological Adaptation - 01specimen.

Identification ……. 01 Mark

Ecological Explanation …….. 02 Marks

Q.No.4. Two Ecological instruments 2x2 = 04M

Identification …….. 1/2 Mark

Working mechanism …… 01 Marks

Application…… 01/2 Mark

Tour Report……. 04 Marks

Journal…….. …… 03 Marks

Reference Books :

1. Odom, E P (1971) Fundamental of Ecology Saunders Philadelphia
2. Agarwal S B and Agarwal M (Ed) 2000 Environmental pollution and responses CRC Press London
3. Varma P S and Agarwal V K 2005 cell biology, Genetics Molecular biology, Evolution and Ecology S Chand Company Ltd.

SEMESTER - IV
MEDICINAL PLANTS IN HEALTH CARE

Course Code: 118OEC-04T **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Scheme : 3:0:0 **Credit : 03**

Course Objectives: The course 118OEC-04T will enable the students to

1. Gain knowledge about Indigenous Medicinal Sciences like Ayurveda, Sidda, Unani.
2. Define Endemic and endangered medicinal plants.
3. Understand Propagation and conservation methods of medicinal plants.
4. Gain knowledge about ethnomedicinal preparations for certain diseases like Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

Course Outcome: Students will able to

118OEC-04.T.1- Familarise the traditional system medicines.
118OEC-04.T.2- Convergent Technique of propagation & conservation of medicinal plants
118OEC-04.T.3- To familiarize the medicinal plants & its applications
118OEC-04.T.4- To know the medicinal plants & its uses.

Mapping of CO with PO and PSO:

CO.	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	BZ	CB	Bbt	BMb
118OEC-04.T.1	3	3	2	3	3	3	2	2	2	3	3	3	3	3
118OEC-04.T.2	3	3	2	3	3	3	2	3	1	3	3	3	3	3
118OEC-04.T.3	3	3	2	3	3	3	2	3	1	3	3	3	3	3
118OEC-04.T.4	3	3	3	3	3	3	3	3	3	2	3	3	3	3

Course Content:

UNIT- I - HISTORY AND TRADITIONAL SYSTEM OF MEDICINE **14hr**

History, Scope and Importance of Medicinal Plants; Traditional systems of medicine. Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments,

Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.

Unani: History, concept: Umoor-e-tabiya, tumors treatments / therapy, polyherbal formulations.

UNIT-II - CULTIVATION AND ETHNOBOTANY & CONSERVATION OF BIODIVERSITY14hr

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Conservation of Endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens.

Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of greenhouse for nursery production, propagation through cuttings, layering, grafting and budding.

UNIT-III- MEDICINAL PLANTS : 11hr

Brief description of selected plants and derived drugs, namely Guggul (Commiphora) for hypercholesterolemia, Boswellia for inflammatory disorders, Arjuna (Terminalia arjuna) for cardioprotection, turmeric (Curcuma longa)f or wound healing, antioxidant and anticancer properties, Kutaki (Picrorhiza kurroa) for hepatoprotection, Opium Poppy for analgesic and antitussive, Salix for analgesic, Cincona and Artemisia for Malaria, Rauwolfia as tranquilizer, Belladona as anticholinergic, Digitalis as cardiotonic, Podophyllum as antitumor.

Sl.	Name of Topic	Teaching Hrs	Marks per Unit	A	B	C	D
1.	History and Traditional System of Medicine	14	28	01	01/02	01/0	01
2.	Cultivation and Ethnobotany & Conservation of Biodiversity.	14	28	01/02	01/02	01/0	01/02
3.	Medicinal Plants	14	28	01/02	01/02	01/0	01/02
		42hrs	**84**				

DEPARTMENT OF ZOOLOGY
B.Sc. -III SEMESTER
Molecular Biology, Bioinstrumentation and Techniques in Biology.

Course Code: 119DSC03T **CIA Marks :40**
Teaching Hrs : 56 **SEE Marks :60**
Scheme : 4:0:0 **Credit : 04**

Course Objectives:

1. This course will emphasize the molecular mechanisms of DNA replication, repair, protein synthesis etc.
2. To gain higher level thinking skills that is necessary for scientists.
3. To provide the fundamental knowledge of Bio-medical Instrumentation, the science associated with the measurement of biological variables such as pressure, temperature etc related to human body, the complexities associated with the measurement of the biological parameters
4. Molecular methods are important tools in all laboratories for routine detection and fingerprinting, as well as aiding in public health surveillance, which could potentially allow the rapid implementation of infection-control and intervention practices.

Course Outcome:

119DSC03T1. To Explain the concept of Gene and the gene architecture of DNA and RNA and Genome organization in prokaryotes and eukaryotes.

119DSC03T2. To describe Regulation of gene expression in prokaryotes and eukaryotes. Post-transcriptionalmodification

1.119DSC03T3. To Identify the components and working principle of microscopes Recognize the steps involved in centrifugation, separation, isolation, and purification of components of a mixture in both qualitative and quantitative analysis

119DSC03T4. To Describe the methodology and applications of biochemical instruments and Molecular Techniques

Mapping of CO with PO and PSO:

CO.	PO												PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
119DSC01T.1	1					3							3	3	3
119DSC01T.2	1					3							3	3	3
119DSC01T.3	1					3							3	3	3
119DSC01T.4	1					3							3	3	3

Course Content :

UNIT - I **14 hr**

Chapter 1 : Process of Transcription **8**

- Fine structure of gene (Cistron, Recon, Muton)
- RNA polymerases- types and functions
- Transcription in prokaryotes and eukaryotes

Chapter 2 : Process of Translation **6**

- Genetic code and its salient features
- Translation in prokaryotes and eukaryotes

UNIT - II **14 hr**

Chapter 3: Regulation of gene expression-I **9**

- Regulation of gene expression in prokaryotes- lac operon (inducible) and trp operon (repressible) in E.coli
- Regulation of gene expression in eukaryotes-Role of chromatin (euchromatin and heterochromatin) in gene expression
- Post-transcriptional modification: capping, splicing, polyadenylation
- Concept of RNA editing (mRNA),gene silencing and RNAi

Chapter 4: Regulation of gene expression-II **5**

- Post-translational modifications: purpose, advantages, and significance; glycosylation, methylation, phosphorylation, and acetylation.
- Intracellular protein degradation (lysosomal autophagy and ubiquitin proteosome pathway).

UNIT - III **14hrs**

Chapter 5 : Microscopy **9**

- Principles and applications of Light microscopy, Dark field microscopy, Phase contrast microscopy, Fluorescence microscopy, Confocal microscopy and Electron microscopy (SEM and TEM).

Chapter 6 : Centrifugation and Chromatography **5**

- Centrifugation: Principles, types, and applications (High speed and Ultracentrifugation)
- Chromatography: Principle and applications of: TLC, HPLC and GC

UNIT - IV **14 hr**

Chapter 7: Biochemical Instrumentation **6**

- Colorimetry and Spectrophotometry: Beer-Lambert's law, Absorption spectrum, UV-VL Spectrophotometer.
- pH meter, measurement of pH
- Principle, applications and safety measures of Radio-tracer techniques-Autoradiography.

Chapter 8 : Molecular Techniques **8**

- Principle and applications of Agarosegel-electrophoresis, SDS-PAGE, DNA Sequencing (Sanger's Dideoxy method)
- PCR, DNA Fingerprinting, ELISA, Southern Blotting and Western Blotting.

UNIT	2Marks	5Marks	08Marks	Total Question	TOTAL Marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of Questions	8	8	8	24	120
Total Marks	16	40	64		

B.Sc. III PRACTICALS
Molecular Biology, Bioinstrumentation & Techniques in Biology

Course Code : 119DSC03P **CIA Marks : 20**
Teaching Hrs : 52 **SEE Marks : 30**
Scheme : 0:0:3 **Credit : 02**

Course Objectives:

1. To study the principle and applications of simple and compound microscopes
2. To study the principle and applications of various lab equipments
3. To learn the preparation of Buffer solutions
4. To learn the process of extraction of DNA from the animal tissue

Course Outcome:

119DSC03P.1 To state the principle and applications of simple and compound microscopes
119DSC03P.2 To state the principle and applications of various lab equipments
119DSC03P.3 To prepare Buffer solutions
119DSC03P.4 To perform the process of extraction of DNA from the animal tissue

Mapping of CO with PO and PSO:

CO.	PO												PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
119DSC03P.1		2				3							3	3	3
119DSC03P.2	1					3							3	3	3
119DSC03P.3	1					3							3	3	3
119DSC03P.4	1					3							3	3	3

Course Content :

S.No List of experiments **14 units(1unit-4hrs)**

1. To study the principle and applications of simple, compound and binocular microscopes. 1
2. To study the principle and applications of various lab equipments-pH meter, Electronic balance, Vortex mixer, use of glass and micropipettes, Laminar airflow, Incubator, shaker, Water bath and centrifuge. 2
3. To prepare Buffer solutions (Phosphate, Citrate, Tris-HCl buffer) 1
4. To prepare stains and fixatives. 1
5. To estimate amount of RNA by Orcinol method. 1
6. Demonstration of differential centrifugation to fractionate components in a given mixture.2
7. To estimate amount of protein by Lowry's method. 1
8. To identify different unknown amino acids using ascending paper chromatography. 2
9. Extraction of DNA from the given animal tissue sample. 2
10. To estimate amount of DNA by di-phenyl amine (DPA)method 2

Marks Units	marks
I	08
II	06
III	05
IV	02
V	02
Total No.of questions	**05**
Total marks	**30**

SUGGESTED READINGS

1. BruceAlberts,Alexander ohnson, JulianLewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell, 4th edition. New York: Garland Science(2002).
2. Daniel L. Hartl and Maryellen Ruvolo. Genetics: Analysis of Genes and Genomes, 8th Edition. Burlington, Mass.:Jones & Bartlett Learning (2012).
3. Gerald Karp.Celland Molecular Biology: Concepts and Experiments, 5th Edition.Wiley Publication (2008).
4. Harvey Lodish, Arnold Berk, Paul Matsudaira ,Chris A.Kaiser, Monty Krieger, Freeman. Molecular Cell Biology, 5th edition.W.H. & Company(2003).
5. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick. Molecular Biology of the Gene,5th edition.Cold Spring Harbor Laboratory Press(2003).
6. Stryer, Lubert. Biochemistry, 2nd Edition.W. H. Freeman and Company, NewYork(1981).

Scheme of Practical Examination

1. Extraction of DNA from the given animal tissue or Estimation of DNA / RNA / Proteins 09M
2. Separate and Identify the given unknown amino acids by using ascending paper Chromatography/Preparation of Buffers and stains 4x2=08M
3. Identify and give the working principle of the spotters A and B 05M
4. Viva 04M
5. Journal 04M

Total 30

B.Sc. -III SEMESTER
ANIMAL BEHAVIOUR

Course Code : 119OEC04 **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Scheme : 3:0:0 **Credit : 03**

Course Objectives:

1. To study how animals move in their environment, how they interact socially, how they learn about their environment, and how an animal might achieve cognitive understanding of its environment.
2. To explain both phylogenetically and physiologically the functional relationships of all factors involved in behavior.
3. To understand the ways in which individuals and groups make economic decisions

Course Outcome:

119OEC04.1 Exhibit critical and integrative thinking skills
119OEC04.2 Demonstrate knowledge of key concepts in animal behavior
119OEC04.3 Explain the behavioral patterns
119OEC04.4 Coordination patterns among processes, individuals or populations

Mapping of CO with PO and PSO:

CO.	PO												PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
119OEC04.1															
119OEC04.2															
119OEC04.3															
119OEC04.4															

Course Content :

Unit - I **14hr**

Chapter-1.: Introduction to Animal Behaviour

- Brief contributions of Karl VonFrish, Ivan Pavlov, KonradLorenz,NikoTinbergen.
- Proximate and ultimate causes of behavior.

Chapter-2.: Patterns of Behavior

- Stereo typed Behaviors-Orientation and Reflex.
- Individual Behavioural patterns: Instinct and Learned Behaviour
- Associative learning, classical and operant conditioning, Habituation, Imprinting.

Unit -II **14hr**

Chapter-3.: Social Behaviour:

- Social organization in termites and honeybees.
- Social behaviour: Altruism.
- Conflict behaviour.

Chapter-4.: Sexual Behaviour

- Sexual dimorphism, Mate choice in peacock.
- Intra-sexual selection (male rivalry in red deer).
- Kinship theory: Relatedness & inclusive fitness.
- Parental care in fishes (Nest Building & costbenefit)

Unit- III- **14hr**

Chapter- 5 : Chronobiology

- Brief historical development sinchrono biology.
- Adaptive significance of biological clocks.
- Biological Rhythms

Chapter- 6: Communications in animals

- Bioluminescence in deep sea fishes and insects
- Territoriality in Monkeys and Dogs
- Role of pheromones in animal communication-Insects and Vertebrates,
- Communication in Honeybees (WaggleDance)

Reference Book:

1. Animal Behaviour by Drickamar.
2. John Alcock, Animal Behaviour, Sinauer AssociateInc.,USA.
3. Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc.,Massachusetts,USA.
4. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey(ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
5. Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.) R.D. Lewis. (3rdEd) 2002 Barensand Noble Inc. NewYork, USA
6. Biological Rhythms:Vinod Kumar(2002)Narosa Publishing House,Delhi/ Springer-Verlag, Germany.

Suggested Readings :

1. William'sText Book of Endocrinology Larsenetal.: An Imprint of Elsevier.
2. Endocrinology, Mac E. Hadley, Pearson Education.
3. The Kidney-Anoutline of Normal and Abnormal Functions, by H. E. Dewardener, ELBS.
4. Vander's Human Physiology, E. P. Widmaieretal.,Mc Graw-Hill, Higher Education.
5. Concise Medical Physiology by S. K. Chaudhuri,New Central Book Agency.
6. Endocrinology.Vols.I,II and III by L.O.De Groot.W.B.Saunders Co.
7. The Physiology of Reproduction,Vols.I & II, by E.Knobil and J.D.Neil.Raven Press.
8. Guyton and Hall.Text book of Medical Physiology. 13th Edition.
9. Histology : A Text and Atlas.Sixth Edition.Ross & Pawlina.Lippincott Williams & Wilkins.
10. Vertebrate Endocrinology by David O.Norris.

UNIT	2Marks	5Marks	08Marks	Total Question	TOTAL Marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of Questions	08	08	08		120
Total Marks	16	40	64	24	

B.Sc. -IV SEMESTER
GENE TECHNOLOGY IMMUNOLOGY AND COMPUTATIONAL BIOLOGY

Course Code: 119DSC04T **CIA Marks :40**
Teaching Hrs : 56 **SEE Marks :60**
Scheme : 4:0:0 **Credit : 04**

Course Objectives:

1. To study the principles of gene manipulation
2. To study the applications of genetic engineering
3. To acquire a fundamental working knowledge of the basic principles of immunology.
4. To collect, store, analyze and disseminate biological data and information

Course Outcome:

- **119DSC04T.1** The student will gain a basic understanding on human genetics and hereditary. They learn about DNA, RNA and their replication, mutations, DNA repair mechanism
- **119DSC04T.2** Explain immune system cells. Discusses active immunity and passive immunity. Will be able to discuss immune response mechanisms.
- **119DSC04T.3** The analysis and interpretation of biological data by using a variety of software tools.
- 119DSC04T.4 Demonstrate a good understanding of descriptive statistics and graphical tools.

Mapping of CO with PO and PSO:

CO.	PO												PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
119DSC04T.1															
119DSC04T.2															
119DSC04T.3															
119DSC04T.4															

Course Content :

Unit-I - **05**

Chapter-1: Principles of Gene Manipulation

- Recombinant DNA Technology: Introduction, steps involved.
- Restriction Enzymes and Ligases and Nucleic acid modifying enzyme.
- Gene cloning Vector: Concept of plasmids- pBR322, Lamda phage vectors, cosmids
- Gene transfer techniques (Direct and indirect).
- Screening and selection of recombinant colonies

Chapter- 2 : Applications of Genetic Engineering

- Transgenic animals (Transgenic cow, Transgenic Fish); Transgenic plants (cryprotein); Gene silencing (Knock out and Knock in mouse).
- Production of Human Recombinant insulin and

- Hybridoma technology: Synthesis and applications of Monoclonal antibodies
- Gene Therapy (SCID)
- Biosensors and its applications

Unit-II -

Chapter -3: Introduction to the Immune System

- Defense against diseases : Introduction, First and second line of defense, Innate and acquired immunity; Antigen presenting cells (APC's), Role of Band T-lymphocytes (Humoral immunity and cell mediated immunity),primary and secondary immune response.
- Types of Immunity
- Functional aspects of organs of the Immune system-Thymus and bone marrow, spleen, Lymph Node, Small intestine and Liver (Peyer's patches and Von Kupffer cells).

Chapter - 4 : Antigens and Antibodies

- Antigens and haptens: Properties (foreignness, molecular size, heterogeneity).
- B and T cell epitopes.
- Structure of IgG and functions of different classes of immunoglobulin.
- Major histocompatibility complex –Structure of MHCI & II.

Unit-III -

Chapter -5 : Clinical Immunology

- Immunity against diseases of viral, bacterial and protozoan infections.
- Vaccines: Types and Uses- Immunization schedule for children.
- Transplantation immunology: Transplantation of organ- Types, graft rejection and Immuno-suppressors.

Chapter - 6 : Bioinformatics

- Databases: Sequence and structural
- Sequence analysis(homology): Pair wise and Multiple Sequence alignment-
  BLAST, CLUSTALW, Sequence alignment-FASTA.
- Scope and applications of Bioinformatics.

Unit-IV -

Chapter - 7 :Biostatistics-I

- Measures of central tendency: Mean, Median, Mode.
- Data summarizing: Frequency distribution, Graphical presentation – bar diagram, pie diagram, histogram.
- Elementary idea of probability and its applications.

Chapter- 8 : Biostatistics II

- Measures of dispersion: Range, Standard Deviation, Variance.
- Correlation and Regression.
- Tests of significance: F-test, ANOVA, t-test and Chi square test.

Reference Book:

1. Primrose & Twyman. Principles of Genome Analysis and Genomics. Blackwell (2003).
2. Hartl & Jones.Genetics: principles & Analsysis of Genes & Genomes.Jones & Bartlett (1998).
3. Sambrook etal. Molecular Cloning Vols I, II, III.CSHL (2001).
4. Primrose. Molecular Biotechnology. Panima (2001).

5. Clark & Switzer. Experimental Biochemistry. Freeman (2000)
6. Sudbery. Human Molecular Genetics. Prentice-Hall (2002).
7. Wilson.Clinical Genetics-A Short Course, Wiley (2000).
8. Pasternak.An Introduction to Molecular Human Genetics.Fritzgerald (2000).
9. Biostatistical Analysis (FourthEdition) by Jerrold H.Zarr, Pearson EducationInc., Delhi.
10. Statistical Methods (Eighth Edition) by G. W.Snecdecor and W. G. Cochran, Willey Blackwell
11. Biostatistics (Tenth Edition) by W. W. Daniel and C. L.Cross,Wiley
12. Introductory Biological Statistics (Fourth Edition) by John E.Havel,Raymond E. Hampton and Scott J.Meiners
13. Westheadetal Bioinformatics:Instant Notes.Viva Books (2003)
14. Genetic engineering:Sandhya Mitra BITS,Pilani
15. Principles of Biostatistics Khan and Khanam
16. Transgenic animals : Ranga

UNIT	2Marks	5Marks	08Marks	Total Question	TOTAL Marks
I	2	2	02	06	30
II	2	2	02	06	30
III	2	2	02	06	30
IV	2	2	02	06	30
Total No. of Questions	08	08	08	24	120
Total Marks	16	40	64		

B.Sc. -IV SEMESTER
GENE TECHNOLOGY IMMUNOLOGY AND COMPUTATIONAL BIOLOGY

Course Code: 119DSC04P **CIA Marks :15**
Teaching Hrs : 52 **SEE Marks :35**
Scheme : 0:0:3 **Credit : 02**

Course Objectives:

1. Explore the basic principles of statistics and some of its common uses
2. Defining the type and quantity of data need to be collected.
3. Identify the basic concept of the ABO blood group system and to know our blood group and type.
4. Basic knowledge of tools use in genetics.

Course Outcome:

1. **119DSC04P.1** Understand the basic principles of probability, descriptive statistics, and data analysis
2. **119DSC04P.2** Biostatistics uses the application of statistical methods to conduct research in the areas of biology.
3. **119DSC04P.3** Identify the basic concept of the ABO blood group system and to know our blood group and type
4. **119DSC04P.4** Basic knowledge to carry out research in genetics, molecular biology

Mapping of CO with PO and PSO:

CO.	PO												PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
119DSC02P.1															
119DSC02P.2															
119DSC02P.3															
119DSC02P.4															

Course Content : List of Practical

1. Calculate the mean,median,mode and standard deviation (Measurement of pre and post clitellar lengths(with suitable examples).
2. Measure the height and weight of all students in the class and apply statistical measures.
3. Determination of ABO Blood group and Rh factor.
4. To study Restriction enzyme digestion using teaching kits(Demonstration only).
5. To detect genetic mutations by Polymerase Chain Reaction (PCR) using teaching kits (Demonstration only).
6. Demonstration of agarose gel electrophoresis for detection of DNA.
7. Demonstration of Polyacrylamide Gel Electrophoresis (PAGE)for detection of proteins.
8. To calculate molecular weight of unknown DNA and protein fragments from gel pictures.(https://youtube/mCiCiO0cfbg)

9.To learn nucleotide sequence database.
10.To learn sequence alignment: Pair wise alignment(Protein/DNA).

Marks Units	marks
I	10
II	06
III	04
IV	05
V	05
Total No. of questions	05
Total marks	**35**

Reference Book:

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan(2000)
2. Zubay et al: Principles of Biochemistry: WCB(1995)
3. Voet &Voet: Biochemistry Vols 1 & 2: Wiley(2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J. E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W. B. Saunders Company.(2006).
6. Tortora, G. J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education(2016).
8. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates,(2004).
9. Chatterjee CC Human Physiology Volume 1 & 2, 11th edition, CBS Publishers (2016).

Scheme of Practical Examination

1.	Qualitative analysis of carbohydrates/lipids /proteins	**10M**
2.	Estimation of hemoglobin in blood / Action of salivary amylase / Preparation of Hematin Crystals	**06M**
3.	Field report	**05M**
4.	Viva	**04M**
5.	Journal	**05M**
	Total	**30**

DEPARTMENT OF STATISTICS
III-SEMESTER
CALCULUS AND PROBABILITY DISTRIBUTIONS

Course Code: 120DSCC03-T **CIA Marks :40**
Teaching Hrs : 56/52 **SEE Marks :60**
Credit : 06

Course Objectives: The course will enable the students to

1. Know the concept of continuity, differentiability, integration of one and more variables.
2. Define and describe properties of Joint, Marginal and conditional distributions of variables and some key concepts of probability theory.
3. Understand different discrete, continuous and sampling distributions, properties and their applications.
4. Generate random variables from various distributions using R-code.

Course Outcome: Students will able to

1. 120DSC03T.1: Judge continuity of a function, find integrations and solve problems of differentiability.
2. 120DSC03T.2: Solve problems of various analytical environments using different distributions and their properties.
3. 120DSC03T.3: Find sampling distributions of functions of random variables and explore their applications.

Mapping of CO with PO and PSO:

CO.	PO										PSO
	1	2	3	4	5	6	7	8	9	10	1
120DSC03T.1	2	-	-	-	-	-	-	2	-	1	2
120DSC03T.2	3	3	3	2	3	3	3	3	3	3	3
120DSC03T.3	2	2	3	3	3	3	3	3	3	3	3

Course Content :

Unit-1 : Calculus of one and more variables **16 Hours**

Differential Calculus: Limits of function, continuous functions, and properties of continuous functions, differentiability, mean value theorem, Taylors formula, partial differentiation and total differentiation. Application of partial differential equation , Jacobians. Maxima and minima of functions. Integral Calculus: Review of integration and definite integral. Differentiation under integral sign. Beta and Gamma integrals: properties and relationship between them.

Unit-II : Distribution of Random Variables (Two-dimensional) **12 Hours**

Two dimensional random variables: Joint distribution, Marginal distribution and Conditional distributions of random variables, conditional expectation, covariance, correlation and moments. Distribution of functions of random variables using m.g.f. and distribution function.. Limit theorems: Chebyshev's inequality- proof and its use in approximating probabilities; Statements of Weak Law of Large Numbers; Convergence in law and Central Limit theorems – De-Moivre. (Some simple examples)

Unit-III :Probability Distributions **14 Hours**

Discrete distributions: Rectangular, Geometric, Negative Binomial, Hyper geometric distributions definitions, mean and variance, properties and applications.

Continuous distributions: Uniform, Gamma (one and two parameters),Exponential, Beta (type 1 and type 2), distributions – definition through probability density function, mean, variance, moments; additive property of exponential and gamma variates, lack of memory property of exponential distribution. Cauchy and Weibull distribution - definition through p.d.f, properties and uses.

Unit-IV: Sampling Distributions **16 Hours**

Definitions of random sample, parameter and statistic, sampling distribution of sample mean, standard error of sample mean, sampling distribution of sample variance, standard error of sample variance. Exact sampling distributions: Chi square distribution, mean, variance, moments, mode, additive property. Definition of Student's and Fishers t-distribution, mean, variance, moments and limiting form of t distribution. Snedecore's F-distribution: mean, variance and mode. Distribution of 1/F (n1,n2). Relationship between t, F and x^2 distributions (no proof).

BOOKS FOR REFERENCE:

1. Anderson T.W. and Jeremy D. Finn (1996). The New Statistical Analysis of Data, Springer
2. Andre I Khuri (2003). Advanced Calculus with Applications in Statistics, Second Edition, John Wiley & Sons.
3. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
4. Gupta, S.C. (2018), Fundamental of Statistics, Himalaya Publishing House, 7th Edition.
5. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
6. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7th Edition.
7. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, 10th Edition, Pearson Education, New Delhi.
8. Medhi, J. (2005), Statistical Methods, New Age International.
9. Rohatgi, V.K. and A.K. Md. Ehsanes Saleh. (2002). An Introduction to Probability Theory and Mathematical Statistics, New York, John Wiley.
10. Ross, S.M. (2014), Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.
11. Shanthi Narayana (2000), Integral Calculus, S. Chand & Co. Ltd.

	Name of the Unit	Teaching Hrs	2 Marks	5 Marks	08 Marks	Total Marks
I	Calculus and limit theorem	16	2	2	2	28
II	Continuous Probability Distributions	16	2	2	2	28
III	Sampling Distributions	16	2	2	2	28
IV	Simulation	08	2	2	2	28
	TOTAL	56	8	8	8	112
	Questions to be answered		4	4	4	12
	Marks		8	20	32	60

III-SEMESTER

CALCULUS AND PROBABILITY DISTRIBUTIONS

Course Code : 120DSCC-03-P **CIA Marks :20**
Teaching Hrs : 4 hr per week **SEE Marks :30**
Scheme : 0:0:2 **Credit : 02**

Course Objectives: The course will enable the students to

1. Sketching various distributions.
2. Fitting of standard univariate distributions.
3. Study of sampling distributions and their relationship, applications

Course Outcome: Students will able to

120DSCC-03-P.1: Sketching various distributions.

120DSCC-03-P.2: Computation of Expectation, moments and Moment generating functions.

120DSCC-03-P.3: Fitting of distributions.

120DSCC-03-P.4: Will be able to use Chi-square, t, F-tests in real life situation

Pedagogy :

1. The course is taught using traditional chalk and talk method using problem solving through examples and exercises.
2. Students are encouraged to use resources available on open sources

   Note: The first practical assignment is on R-programming. Practical assignments 2 to 10 have to be first solved manually (using scientific calculators) and executed using MS Excel / R-programming.

PRACTICAL

1. Demonstration of R functions for calculus, distribution of random variables, probability distributions, sampling distribution simulation.
2. Numerical differentiation and integration.
3. Bivariate Probability Distributions - Marginal and Conditional distributions,
4. Bivariate Probability Distributions - Conditional Mean, Conditional Variance, Correlation.
5. Applications of Chebyshev's inequality (For standard distributions such as Normal, Exponential, Gamma).
6. Applications of discrete probability distributions - Negative – Binomial, Geometric, Hyper geometric and discrete uniform, multinomial distributions.
7. Applications of continuous probability distributions - Exponential, Gamma, Cauchy, Weibull distributions.
8. Fitting of continuous distributions.

DEPARTMENT OF STATISTICS
IV-SEMESTER
STATISTICAL INFERENCE-I

Course Code: 120DSCC04-T **CIA Marks :40**
Teaching Hrs : 56/52 **SEE Marks :60**
Credit : 06

Course Objectives: The course will enable the students to

1. Families of distributions, order statistics and their distributions.
2. Estimation, criteria for estimators, methods of estimation, confidence interval.
3. Testing of Hypotheses and its theoretical aspects, large and small sample tests.

Course Outcome: Students will able to

1. 120DSC04T.1: Carryout statistical analysis by identifying families of distributions and the use of order statistics.
2. 120DSC04T.2: To find estimators using different methods of estimation and compare estimators.
3. 120DSC04T..3: To carryout statistical inference using different tests of hypotheses under different Scenarios.
4. 120DSC04T.4: Generate random variables and use these generated random variable for illustration of concepts studied in this course.

Mapping of CO with PO and PSO:

CO.	PO										PSO
	1	2	3	4	5	6	7	8	9	10	1
120DSC04T.1	2	1	3	1	2	--	1	2	2	3	2
120DSC04T.2	2	3	2	3	--	2	--	2	3	2	2
120DSC04T.3	3	3	3	2	--	2	2	3	3	3	3
120DSC04T.4	1	--	--	--	3	--	2	2	2	1	1

Course Content :

Unit-1 : Point Estimation : **14hrs**

Families of distributions- location and scale families. Single parameter exponential family. Concept of ordered statistics (For maximum and minimum with proof and for r^{th} order without proof). Concepts of estimator and estimate. Criteria for estimators: Unbiasedness, Consistency. Invariance property of consistent estimators. Efficiency and relative efficiency. Mean squared error as a criterion for comparing estimators. Sufficient statistics. Statement of Neyman-Factorization theorem. Fisher information function. Statement of Cramer–Rao inequality and its applications. Minimum Variance Unbiased Estimator and Minimum Variance Bound Estimator.

Unit-II : Methods of Estimation and Interval Estimation **16hrs**

Maximum likelihood and method of moment estimation; Properties of MLE and moment estimators and examples. Confidence interval, confidence coefficient, shortest confidence interval. Method of constructing confidence intervals using pivotal quantities. Construction of confidence intervals for mean, difference of two means. variance and ratio of variance, Proportional, difference of two proportions.

Unit-III : Basics of Testing of Hypothesis - I **14hrs**

Statistical hypotheses - null and alternative, Simple and composite hypotheses. Type-I and Type-II errors, test functions. Randomized and non-randomized tests. Size, level of significance, Power function, power of tests. Critical region, p- value and its interpretation. Most Powerful (MP) and UMP test. Statement of Neyman-Pearson Lemma and its applications. LRT

Unit-IV : Testing of Hypothesis – II **12hrs**

Large and small samples tests of significance. Tests for single mean, equality of two means, single variance and equality of two variances for normal populations. Tests for proportions.

Books for Reference:

1. Anderson T.W. and Jeremy D. Finn (1996). The New Statistical Analysis of Data, Springer
2. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
3. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
4. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7th Edition.
5. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, 10th Edition, Pearson Education, New Delhi.
6. Johnson, R.A. and Bhattacharyya, G.K. (2006), Statistics: Principles and methods. 5th Edition, John Wiley & Sons, New York.
7. Kendall, M.G., et. al., (1996).An Introduction to the Theory of Statistics, Universal Book Stall.
8. Medhi, J. (2005), Statistical Methods, New Age International.
9. Rohatgi, V.K. and A.K. Md. Ehsanes Saleh. (2002). An Introduction to Probability Theory and Mathematical Statistics, New York, John Wiley.
10. Ross, S.M. (2014), Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.

Pedagogy:

1. The course is taught using traditional chalk and talk method using problem solving through examples and exercises.
2. Students are encouraged to use resources available on open sources.

Sl. No.	Name of Unit	Teaching Hrs	2 Marks	5 Marks	08 Marks	Total Marks
I.	Point Estimation	14	2	2	2	28
II.	Methods of Estimation and Interval Estimation	16	2	2	2	28
III.	Basics of Testing of Hypothesis - I	14	2	2	2	28
IV.	Testing of Hypothesis - II	12	2	2	2	28
	TOTAL	56	8	8	8	112
	Questions to be answered		4	4	4	12
	Marks		8	20	32	60

IV-SEMESTER
STATISTICAL INFERENCE-I

Course Code: 120DSCC-04-P **CIA Marks :20**
Teaching Hrs : 4hrs/week **SEE Marks :30**
Scheme : 0:0:2 **Credit : 02**

Course Objectives: The course will enable the students to

1. To write Null and Alternative hypotheses.
2. Study of testing the hypothesis
3. To understand the methods of estimation of parameters.
4. Able to understand interval estimation and their applications in the practical life.

Course Outcome: Students will able to

120DSCC-04-P.1: Computation of estimators by using MLE and method of moments.
120DSCC-04-P.2: To outline the difference between Point and Interval estimation.
120DSCC-04-P.3: To find the Type-I and Type-II error for the problems
120DSCC-04-P.4: The problems related to Testing of Hypothesis.

Contents of Practical 4

Note: The first practical assignment is on R-programming and R packages. Practical assignments 2 to 10 have to be first solved manually (using scientific calculators) and executed using MS Excel /R- programming.

Practical :

1. Demonstration of R-functions for estimation and testing of hypotheses.
2. Point estimation of parameters and obtaining estimate of standard errors and mean square error.
3. Computing maximum likelihood estimates.
4. Computing moment estimates.
5. Interval estimation
6. Evaluation of Probabilities of Type – I and Type – II errors and power of tests.
7. Tests for mean, equality of means under normality when variance is (i) known (ii) unknown, P-values.
8. Test for single proportion and equality of two proportions, variance and equality of two variances under normality. P-values for the above tests.
9. Large sample tests: Tests for mean, equality of means when variance is (i) known (ii) unknown, variance and equality of two variances under normality. P- values for the above tests.
10. MP and UMP tests for parameters of binomial, Poisson distributions, normal and Exponential (scale parameter only) distributions and power curve.

IV-SEMESTER
OPEN ELECTIVE COURSE - I
POPULATION STUDIES

Course Code: 120OEC03T **CIA Marks :40**
Teaching Hrs : **SEE Marks :60**
Credit : 03

Course Objectives: The course will enable the students to

1. To enable the students to identify appropriate sources of data, perform basic demographic analysis using various techniques and ensure their comparability across populations.
2. To acquire knowledge about the construction of life table and its applications in demographic analysis.

Course Outcome: Students will able to

120OEC03T.1:Study the concepts of Vital Statistics, sources of data, different measures of Fertility, Mortality and migration.

120OEC03T.2: Understand the Growth rates- GRR and NRR and their interpretations.

Mapping of CO with PO and PSO:

CO.	PO										PSO
	1	2	3	4	5	6	7	8	9	10	1
120OEC03T.1	2	3	--	2	--	--	3	2	3	2	2
120OEC03T.2	1	2	2	--	--	--	2	2	2	2	2

Pedagogy

1. The course is taught using traditional chalk and talk method using problem solving through examples and exercises.
2. Students are encouraged to use resources available on open sources.

Course Content :

Unit-1 : Introduction and Sources of Population Data **08hrs**

History, definition, nature and scope of population Studies. Sources of population data – salient features of Census, Civil Registration System, National Sample Surveys, Demographic Surveys,

RBI, NFHS, WHO, UNO, PRB Etc. relative merits and demerits of these sources.

Unit-II : Fertility Rates : **12hrs**

Basic concepts and terms used in the study of fertility. Measures of fertility- Crude Birth Rate (CBR), General Fertility Rate (GFR), Age Specific Fertility Rate (ASFR), Total Fertility Rate (TFR), Birth order statistics, Child Women ratio. Measures of reproduction- Gross Reproduction Rate (GRR)and Net Reproduction rate(NRR).

Unit-III : Mortality rates : **10hrs**

Basic concepts and terms used in the study of mortality. Measures of mortality- Crude Death Rate (CDR), Age Specific Death Rate (ASDR), Direct and Indirect Standardized Death rates, Neo-natal mortality rate, Post-natal mortality rate; Maternal Mortality Rate (MMR). Infant Mortality Rate (IMR), Under-five mortality Rate.

Unit-IV : Life tables and Population change **12hrs**

Life tables: Introduction, definition, Components of a life table, Uses of life tables. types of life tables. Construction of complete life table.

Basic concepts and definition of population change, migration. Types of migration-internal and international, factors affecting migration. Rates and ratios of Migration. Push-pull factors, Introduction to Population estimates and projections.

Books for Reference:

1. Keyfitz, H (1968). Introduction to the Mathematics of Population. Addison-Wesley Publishing Co.
2. Pathak, K.B and Ram, F (1991).Techniques of Demographic Analysis, Himalaya Publishing House.
3. Ramakumar. R (1986). Technical Demography, Wiley Eastern Ltd.
4. Srinivasan. K (1998). Basic Demographic Techniques and Applications, Sage Publication, New Delhi.
5. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Applied Statistics, Sultan Chand and Co. 12th Edition.

Sl. No.	Name of Unit	Teaching Hrs	2 Marks	5 Marks	10 Marks	Total Marks
I.	Introduction and Sources of Population Data	08	2	2	2	28
II.	Fertility Rates	12	2	2	2	28
III.	Mortality Rates	10	2	2	2	28
IV.	Life tables and Population change	12	2	2	2	28
	TOTAL	42	8	8	8	112
	Questions to be answered		4	4	4	12
	Marks		8	20	32	60

IV-SEMESTER
OPEN ELECTIVE COURSE - II
BASICS OF OPERATIONS RESEARCH

Course Code: 1200EC03T **CIA Marks :40**
Teaching Hrs : **SEE Marks :60**
Credit : 03

Course Objectives: The course will enable the students to

1. Students get knowledge about the scope and application of Operations Research(OR) in business and industry.
2. Exposes the students to various OR tools and models.
3. To get knowledge about various decision making through OR models.

Course Outcome: Students will able to

120OEC04T.1-Generate mathematical models of business environment.

120OEC04T.2-Analyze the business situations.

120OEC04T.3-Use different solution procedures through OR models.

Mapping of CO with PO and PSO:

CO.	PO										PSO
	1	2	3	4	5	6	7	8	9	10	1
120OEC04T.1	2	2	3	--	--	--	--	1	2	1	1
120OEC04T.2	1	2	3	3	--	--	2	2	2	2	2
120OEC04T.3	1	2	2	3	2	2	3	3	2	2	2

Pedagogy

1. The course is taught using traditional chalk and talk method using problem solving through examples and exercises.
2. Students are encouraged to use resources available on open sources.

Course Content :

Unit-1 : Introduction to Operations Research (OR) **12hrs**

Origin and growth of OR, importance of OR in managerial decision making, scope and applications of OR, models. Linear programming problems(LPP): Formulation of the problem, feasible & infeasible, basic feasible solution, optimal, unbounded and multiple optimal solutions of LPP, Solution by graphical method. Slack, Surplus and Artificial variables. Duality in LPP, simple illustration, Importance of Duality Concepts,

Unit-II : Allocation Problems : **14hrs**

Transportation problems: Formulation, methods of finding initial solution (North West Corner Rule, Least Cost Method and Vogel's Approximation Method), unbalanced transportation problems.

Assignment problems: Formulation, methods of solution, Hungarian method, multiple optimal solutions, unbalanced problems,

Unit-III : Game Theory : **08hrs**

Game theory: Basic concepts. Two – Person Zero Sum Game. Pure and Mixed Strategies. Maximin – Minimax principle, Games with and without saddle points. Principle of dominance.

Unit-IV : Net work theory: **08hrs**

Concepts of network analysis, project network models, CPM and PERT.

Books for Reference:

1. Hillier, F S, et al. Introduction to Operations Research (9/e). Tata McGraw Hill, 2011.
2. Ravindran, A and Don T Phillips. Operations Research: Principles and Practice. John Wiley & Sons, 1987.
3. Sharma, J K. Operations Research: Theory and Applications (5/e). New Delhi: Laxmi Publications, 2013.
4. Taha, Hamdy A. Operations Research: An Introduction (9/e). Prentice Hall, 2010.
5. Vohra, N D. Quantitative Techniques for Management. Tata McGraw Hill Education, 2015.
6. Kanti Swarup, Gupta, P.K. and Man Mohan: Operations Research, Sultan Chand & Sons, New Delhi.
7. Kapoor, V.K: Operations Research, Sultan Chand & Sons, New Delhi.
8. Kapoor, V.K.: Operations Research Problems & Solutions, Sultan Chand & Sons, New Delhi.

Sl. No.	Name of Unit	Teaching Hrs	2 Marks	5 Marks	10 Marks	Total Marks
I	Introduction to Operations Research(OR)	12	2	2	2	28
II	Allocation Problems	14	2	2	2	28
III	Game theory	08	2	2	2	28
IV	Net work theory	08	2	2	2	28
	TOTAL	42	8	8	8	112
	Questions to be answered		4	4	4	12
	Marks		8	20	32	60

DEPARTMENT OF BIOTECHNOLOGY
SEMESTER - III
BIOMOLECULES

Course Code: BTC: 103 DCS -3T **CIA Marks :40**
Teaching Hrs : 56 **SEE Marks :60**
Scheme : 4:0:0 **Credit : 04**

Course Objectives: The course will enable the students to

1. Acquire knowledge about types of biomolecules, structure, and their functions
2. Will be able to demonstrate the skills to perform bioanalytical techniques
3. Apply comprehensive innovations and skills of biomolecules to biotechnology field

Course Content:

UNIT- I : a) Carbohydrates: **14hrs**

Introduction, sources, classification of carbohydrates. Structure,function and properties of carbohydrates. Monosaccharides – Isomerism and ring structure, Sugar derivatives – amino sugars and ascorbic acid

Oligosaccharides – Sucrose and Fructose

Polysaccharides – Classification as homo and heteropolysaccharides, Homopolysaccharides - storage polysaccharides (starch and glycogen- structure, reaction, properties), structural polysaccharides (cellulose and chitin-structure,properties),Heteropolysaccharides - glycoproteins and proteoglycans (Brief study). Metabolism:Glycolysis and gluconeogenesis, Kreb's cycle, oxidative phosphorylation

b) Amino Acids, Peptides and Proteins

Introduction, classification and structure of amino acids. Concept of – Zwitterion, isoelectric point, pK values. Essential and nonessential amino acids. Peptide bond and peptide, classification of proteins based on structure and function, Structural organization of proteins[primary, secondary (α,), tertiary and quaternary]. Fibrous and globular proteins, Denaturation and renaturation of proteins General aspects of amino acid metabolism:Transamination, deamination, decarboxylation and urea cycle

UNIT-II : a) Lipids : **14hrs**

Classification and function of lipids, properties (saponification value, acid value, iodine number, rancidity), Hydrogenation of fats and oils Saturated and unsaturated fatty acids. General structure and biological functions of - phospholipids, sphingolipids, glycolipids, lipoproteins, prostaglandins, cholesterol, ergosterol. Metabolism: Beta oxidation of fatty acids. Biosynthesis of cholesterol.

b) Enzymes :Introduction, nomenclature and classification, enzyme kinetics, factors influencing enzyme activity,metalloenzymes, activation energy and transition state, enzyme activity, specific activity. Coenzymes and their functions (one reaction involving FMN, FAD, NAD). Enzyme inhibition- Irreversible and reversible (competitive, non-competitive and uncompetitive

inhibitionwith an example each) Zymogens (trypsinogen, chymotrypsinogen and pepsinogen), Isozymes (LDH, Creatine kinase, Alkaline phosphatase and their clinical significance)

UNIT-III : Vitamins : 14hrs

Water and fat soluble vitamins, dietary source and biological role of vitamins Deficiency manifestation of vitamin A, B, C, D, E and K

a) Nucleic acids : Structures of purines and pyrimidines, nucleosides, nucleotides in DNA Denovo and salvage pathway of purine and pyrimidine synthesis.

b) Hormones : Classification of hormones based on chemical nature and mechanism of action. Chemical structureand functions of the following hormones: Glucagon, Cortisone, Epinephrine, Testosterone and Estradiol.

UNIT-IV : Bioanalytical tools : 14hrs

a) Chromatography : Principle, procedure and applications of - paper chromatography, thin layer chromatography, adsorption chromatography, ion exchange chromatography,gel filtration chromatography, affinity chromatography, gas liquid chromatography and high performanceliquid chromatography.

b) Electrophoresis : Principle, procedure and applications of electrophoresis (paper electrophoresis, gel electrophoresis -PAGE, SDS- PAGE &agarose electrophoresis) and isoelectric focusing.

c) Spectroscopy : UV-Vis spectrophotometry; mass spectroscopy, atomic absorption spectroscopy.

Mapping of CO with PO and PSO:

CO. / PO	1	2	3	4	5	6	7	8	9	10	11	12
Acquire knowledge about types of biomolecules, structure, and their functions	✓				✓							✓
Will be able to demonstrate the skills to perform bioanalytical techniques			✓								✓	✓
Apply comprehensive innovations and skills of biomolecules to biotechnology field	✓				✓							✓

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 mark

SEMESTER - III (Practical)
BIOMOLECULES

Course Code: BTC:103 DSC-3P **CIA Marks :25**
Credit : 02 **SEE Marks :25**

Course Content:

1. Introduction to basic instruments (Principle, standard operating procedure) with demonstration.
2. Definitions and calculations:Molarity, Molality, Normality, Mass percent % (w/w), Percent byvolume (% v/v), parts per million (ppm), parts per billion (ppb), Dilution of concentrated solutions. Standard solutions, stock solution, solution of acids. Reagent bottlelabel reading and precautions.
3. Preparation of standard buffers by Hendersen-Hasselbach equation – Acetate, phosphate,Tris and determination of pH of solution using pH meter.
4. Estimation of maltose by DNS method
5. Determination of a-amylase activity by DNS method
6. Estimation of proteins by Bradford method
7. Estimation of amino acid by Ninhydrin method
8. Extraction of protein from soaked/sprouted green gram by salting out method
9. Separation of plant pigmentsby circular paper chromatography
10. Separation of amino acids by thin layer chromatography
11. Native PAGE
12. Determination of iodine number of lipids

References

1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu.Pvt.Ltd. New Delhi, India
2. Biochemical Methods,1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India
3. Introductory Practical biochemistry, S. K. Sawhney&Randhir Singh (eds) Narosa Publishing. House, New Delhi, ISBN 81-7319-302-9
4. Experimental Biochemistry: A Student Companion, BeeduSasidharRao& Vijay Despande(ed).I.K International Pvt. LTD, NewDelhi. ISBN 81-88237-41-8
5. Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers, Ludhiana ISBN 81-7663-067

Formative assessment		Summative Assessment	Total Marks
Assessment Occasion / type	**Weightage in Marks**	**Practical Exam**	
Record	5	25	50
Test	10		
Attendance	5		
Performance	5		
Total	**25**	**25**	

SEMESTER - III
NUTRITION AND HEALTH

Course Code: BTC:103 OEC-3 **CIA Marks :40**
Teaching Hrs : **SEE Marks :60**
Scheme :

Course Objectives: The course will enable the students to

1. Study the concepts of food, nutrition, diet and health
2. To apply the best practices of food intake and dietary requirements
3. Acquire knowledgeabout various sources of nutrients and goodcooking practices

Course Content:

UNIT- I: Introduction **14hrs**

Concepts of nutrition and health. Definition of Food, Diet and nutrition, Food groups. Food pyramids. Functions of food. Balanced diet. Meal planning. Eat right concept. Functional foods, Prebiotics, Probiotics, and antioxidants.

UNIT-II : Nutrients **14hrs**

Macro and Micronutrients - Sources, functions and deficiency.Carbohydrates, Proteins, Fats –Sources and calories. Minerals –Calcium, Iron, Iodine.

Vitamins – Fat soluble vitamins –A, D, E & K. Water soluble vitamins – vitamin C Thiamine, Riboflavin, Niacin. Water–Functions and water balance. Fibre –Functions and sources. Recommended Dietary Allowance, Body Mass Index and Basal Metabolic Rate.

UNIT-III : Nutrition and Health **14hrs**

Methods of cooking affecting nutritional value. Advantages and disadvantages. Boiling, steaming, pressure cooking. Oil/Fat – Shallow frying, deep frying. Baking. Nutrition through lifecycle. Nutritional requirement, dietaryguidelines:Adulthood, Pregnancy, Lactation, Infancy^Complementary feeding, Pre-school, Adolescence, geriatric. Nutrition related metabolic disorders- diabetes and cardiovascular disease.

Reference Book :

1. Sri Lakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2. Sri Lakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3. Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4. Gopalan.C., RamaSastry B.V., and S.C.Balasubramanian (2009), Nutritive value of Indian Foods.NIN.ICMR.Hyderabad.
5. Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi.

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 mark

DEPARTMENT OF BIOTECHNOLOGY
SEMESTER - IV
MOLECULAR BIOLOGY

Course Code: BTC: 104 DCS -4T **CIA Marks :40**
Teaching Hrs : 56 **SEE Marks :60**
Scheme : **Credit : 04**

Course Objectives: The course will enable the students to

1. Study the advancements in molecular biology with latest trends.
2. Will acquire the knowledge of structure, functional relationship of proteins and nucleic acids.
3. Aware about the basic cellular processes such as transcription, translation, DNA replication and repair mechanisms.

Course Content:

UNIT- I: Molecular basis of life and Nucleic Acids : 14hrs

An introduction RNA and experimental proof of DNA as genetic material and types of DNA.Structure and functions of DNA and RNA, Watson and Crick model of DNA and other forms of DNA (A and Z) functions of DNA and RNA including ribozymes.

UNIT-II : DNA Replication and Repair : 14hrs

Replication of DNA in prokaryotes and eukaryote– Enzymes and proteins involved in replication, Theta model, linear and rolling circle model. Polymerases and all enzyme components.

The replication complex: Pre-primming proteins, primosome, replisome, unique aspects of eukaryotic chromosome replication, Fidelity of replication DNA damage and Repair mechanism: photo reactivation, excision repair, mismatch repair and SOS repair.

UNIT-III: Transcription and RNA processing : 14hrs

Central dogma, RNA structure and types of RNA, Transcription in prokaryotes RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains.

Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

UNIT-IV : Regulation of gene expression and translation : 14hrs

Genetic code and its characteristics, Wobble hypothesisTranslation- in prokaryotes and eukaryotes- ribosome, enzymes and factors involved in translation. Mechanism of translationˆactivation of amino acid, aminoacyl tRNA synthesis, Mechanism- initiation, elongation and termination of polypeptide chain. Fidelity of translation, Inhibitors of translation. Protein folding and modifications, Post translational modifications of proteins.

Reference Book :

1. Mushroom Production and Processing Technology, PathakYadavGour (2010) Published by Agrobios (India).
2. A hand book of edible mushroom, S.Kannaiyan&K.Ramasamy (1980). Today & Tomorrows printers & publishers, New Delhi
3. Handbook on Mushrooms, Nita Bahl, oxford & IBH Publishing Co.

Mapping of CO with PO and PSO:

CO. / PO	1	2	3	4	5	6	7	8	9	10	11	12
Study the advancements in molecular biology with latest trends	✓				✓							✓
Will acquire the knowledge of structure, functional relationship of proteins and nucleic acids					✓	✓						✓
Aware about the basic cellular processes such as transcription, translation, DNA replication and repair mechanisms	✓				✓				✓			✓

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 mark

SEMESTER - III
MOLECULAR BIOLOGY

Course Code: BTC: 104 DSC-4P **CIA Marks :25**
Teaching Hrs : **SEE Marks :25**
Scheme : **Credit : 02**

Course Content:

1. Preparation of DNA model
2. Estimation of DNA by DPA method
3. Estimation of RNA by Orcinol method
4. Column chromatography – gel filtration (Demo)
5. Extraction and partial purification of protein from plant source by Ammoniumsulphate precipitation.
6. Extraction and partial purification of protein from animal source by organic solvents.
7. Protein separation by SDS-Polyacrylamide Gel Electrophoresis (PAGE)
8. Charts on- Conjugation, Transformation and Transduction, DNA replication, Types of RNA

References

1. Glick, B.R and Pasternak J.J (1998) Molecular biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press
2. Howe. C. (1995) Gene cloning and manipulation, Cambridge University Press, USA
3. Lewin, B., Gene VI New York, Oxford University Press
4. Rigby, P.W.J. (1987) Genetic Engineering Academic Press Inc. Florida, USA
5. Sambrook et al (2000) Molecular cloning Volumes I, II & III, Cold spring Harbor Laboratory Press New York, USA
6. Walker J. M. and Ging old, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry U.K
7. Karp. G (2002) Cell & Molecular Biology, 3rd Edition, John Wiley & Sons; I

Formative assessment		Summative Assessment	Total Marks
Assessment Occasion / type	**Weightage in Marks**	**Practical Exam**	
Record	5	25	50
Test	10		
Attendance	5		
Performance	5		
Total	**25**	**25**	

SEMESTER - IV
INTELLECTUAL PROPERTY RIGHTS

Course Code: BTC: 104 OEC -4 **CIA Marks :40**
Teaching Hrs : **SEE Marks :60**
Scheme : **Credit : 03**

Course Pre-requisite(s): Semester I and II of composite Home Science.

Course Outcomes:

1. Knowledge about need and scope of Intellectual property rights
2. Acquire knowledge about filing patents, process, and infringement
3. Knowledge about trademarks, industrial designs, and copyright

Course Content:

UNIT- I:- Introduction to Intellectual property rights (IPR): 14hrs

Genesis and scope. Types of Intellectual property rights - Patent, Trademarks, Copyright, Design, Trade secret, Geographical indicators, Plant variety protection. National and International agencies – WIPO, World Trade Organization (WTO), Trade-Related Aspects of Intellectual Property Rights (TRIPS), General Agreement on Tariffs and Trade (GATT).

UNIT-II : Patenting, process, and infringement : 14hrs

Basics of patents - Types of patents; Patentable and Non-Patentable inventions, Process and Product patent. Indian Patent Act 1970; Recent amendments; Patent Cooperation Treaty (PCT) and implications. Process of patenting. Types of patent applications: Provisional and complete specifications; Concept of “prior art", patent databases (USPTO, EPO, India). Financial assistance, schemes, and grants for patenting. Patent infringement- Case studies on patents (Basmati rice, Turmeric, Neem)

UNIT-III: - Trademarks, Copy right, industrial Designs 14hrs

Trademarks- types, Purpose and function of trademarks, trademark registration, Protection of trademark. Copy right- Fundamentals of copyright law, Originality of material, rights of reproduction, industrial Designs: Protection, Kind of protection provided by industrial design.

Reference Book :

1. Manish Arora. 2007. Universal's Guide to Patents Law (English) 4th Edition) -Publisher: Universal Law Publishing House
2. Kalyan C. Kankanala. 2012. Fundamentals of Intellectual Property. Asia Law House
3. Ganguli, P. 2001. Intellectual Property Rights: Unleashing the knowledge economy. New Delhi: Tata McGraw-Hill Pub
4. World trade organization - http://www.wto.org
5. World Intellectual Property organization – www.wipo.intOffice of the controller general of Patents, Design & Trademarks - www.ipindia.nic.in

Summative assessment = 40 marks theory paper, End semester Exam duration of exam 2 hours	
Assignment	10
Seminar	10
Case studies	10
Test	10
Total	40 marks

DEPARTMENT OF MICROBIOLOGY
III-Semester
MICROBIAL DIVERSITY

Course Code: MBL-103 DCS -3T **CIA Marks :40**
Teaching Hrs : 56 **SEE Marks :60**
Credit : 04

Course Objectives: The course will enable the students to

1. Knowledge about microbes and their diversity
2. Study, characters, classification and economic importance of Pro-eukaryotic and Eukaryotic microbes.
3. Knowledge about viruses and their diversity

UNIT 1 : Biodiversity and Microbial Diversity **06hrs**

Concept, definition, and levels of biodiversity; Biosystematics – Major classification systemsˆNumerical and Chemotaxonomy. Study and measures of microbial diversity; Conservation and Economic values of microbial diversity.

UNIT 2: Diversity of Prokaryotic Microorganisms **10hr**

General characters; Classification; Economic importance; Distribution and factors regulating distribution.

Bacteria and Archaea- An overview of Bergey's Manual of Systematic Bacteriology.Bacteriaˆ*Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*

Cyanobacteria- Nostoc, Microcystis, Spirulina

Archea Thermusaquaticus, Methanogens

Actinomycetes : Streptomyces, Nocordia, Frankia

Rickettsiae - Rickettsia rickettsi

Chlamydiae – Chlamydia trachomatis

Spirochaetes - Trepanemapallidum

UNIT 3 : Diversity of Eukaryotic Microorganism **14hr**

Diversity of Eukaryotic Microorganism: General characters; Classification- Economic importance

Fungi : Ainsworth classification- detailed study up to the level of classes, Salient features and reproduction. Type study: Rhizopus, Saccharomyces, Aspergillus, Agaricus, Fusarium

Algae: Occurrence, distribution, and symbiotic association- Lichen; thallus organization and types. Type study: Chlorella, Cosmarium, Diatoms,Gracilaraia,

Protozoa: Classification up to the level of classes. Type study: Amoeba, Euglena, Trichomonas, Paramoecium, Trypanosoma

UNIT 3 : Diversity of Virus **14hr**

General properties and structure, Isolation and purification and assay of virus. Principles of Viral

Taxonomy- Baltimore and ICTV and the recent trends.

Capsid symmetry- Icosahedral, helical, complex

Animal : HIV, Corona, Ortho and paramyxovirus, Oncogenic virus

Plants : TMV, Ring spot virus

Microbial : T4/T7/lambda/cyano/mycophages. Sub viral particles. Virans and Prions. Ortho and Paramyxo Virus. Oncogenic Virus

Mapping of CO with PO and PSO:

CO. PO												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Study the advancements in molecular biology with latest trends	✓				✓							✓
Will acquire the knowledge of structure, functional relationship of proteins and nucleic acids					✓	✓						✓
Aware about the basic cellular processes such as transcription, translation, DNA replication and repair mechanisms	✓				✓				✓			✓

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 mark

III-Semester

Microbial Genetics and Recombinant DNA Technology

Course Code: MBL-103 DSC-4P **CIA Marks :25**
Teaching Hrs : **SEE Marks :25**
Scheme : **Credit : 02**

Course Content :

1. Study of morphology of bacteria
2. Isolation of bacteria from soil
3. Isolation of bacteria from air and water
4. Isolation of fungi from soil
5. Isolation of fungi from air and water
6. Cultivation of Cyanobacteria
7. Cultivation of actinomycetes
8. Measurement of microbial cell size by Micrometry
9. Cyanobacteria Nostoc, MicrocyctisSpirulina
10. Study of Algae Chlorella Diatoms, Gracilaria
11. Study of Fungi Rhizopus Saccharomyces Agaricus
12. Study of Protozoa Amoeba Paramoecium Euglena
13. Study of Photographs or Models
14. HIV, TMV, Corona virus T4Phage
15. Paramyxovirus Oncogenic viruses

References :

1. Black, J.G. 2002. Microbiology-Principles and Explorations. John Wiley and Sons, Inc. New York
2. Brock, T.D. and Madigan, M.T. 1988. Biology of Microorganisms, V Edition. Prentice Hall. New Jersey
3. Dimmock, N. J., Easton, A. J., and Leppard, K. N. 2001. Introduction to Modern Virology. 5th edn. Blackwell publishing, USA
4. Flint, S.J., Enquist, L.W., Drug, R.M., Racaniello, V.R. and Skalka, A.M. 2000. Principles of Virology- Molecular Biology, Pathogenesis and Control. ASM Press, Washington, D.C
5. Prescott, Harley, Klein's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, 7th International, edition 2008, McGraw Hill
6. Vashishta B.R, Sinha A.K and Singh V. P. Botany – Fungi 2005, S. Chand and Company Limited, New Delhi
7. Kotpal R.L Protozoa 5th Edition 2008, Rastogi Publications, Meerut, New Delhi.
8. Brock Biology of Microorganisms, M.T. Madigan, J.M. Martinko, P. V. Dunlap, D. P. Clark- 12th edition, Pearson International edition 2009, Pearson Benjamin Cummings
9. Microbiology – An Introduction, G. J. Tortora, B. R. Funke, C. L. Case, 10th ed. 2008, Pearson Education

10. General Microbiology, Stanier, Ingraham et al, 4th and 5th edition 1987, Macmillan education limited
11. Microbiology- Concepts and Applications, Pelczar Jr. Chan, Krieg, International ed, McGraw Hill
12. Alexopoulos, C.J., Mims, C.W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp
13. Vashishta, B.R Sinha A.K and Singh V. P. Botany - Algae 2005 S. Chand and Company Limited, New Delhi
14. A Textbook of Microbiology, R. C. Dubey, and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd, New Delhi
15. Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill

Formative assessment		**Summative Assessment**	**Total Marks**
Assessment Occasion / type	**Weightage in Marks**	**Practical Exam**	
Record	5	25	50
Test	10		
Attendance	5		
Performance	5		
Total	**25**	**25**	

III-Semester

Microbial Entrepreneurship

Course Code: MBL-104-OEC-3 **CIA Marks :40**
Teaching Hrs : **SEE Marks :60**
Scheme : **Credit : 03**

Course Objectives: The course will enable the students to

1. Demonstrate entrepreneurial skills
2. Acquire knowledge industrial entrepreneurship
3. Acquire knowledge about Healthcare Entrepreneurship

UNIT I : General Entrepreneurship **14hrs**

Entrepreneurship and microbial entrepreneurship - Introduction and scope, Business development, product marketing, HRD, Biosafety and Bioethics, IPR and patenting, Government organization/ institutions/ schemes, Opportunities and challenges.

UNIT II: Industrial Entrepreneurship **14hrs**

Microbiological industries – Types, processes and products, Dairy products, Fermented foods, Bakery and Confectionery, Alcoholic products and Beverages, Enzymes – Industrial production and applications. Biofertilizers and Biopesticides, SCP (Mushroom and Spirulina) etc.

UNIT III : Healthcare Entrepreneurship **14hrs**

Production and applications: Sanitizers, Antiseptic solutions, Polyhenols (Flavonoids), Alkaloids, Cosmetics, Biopigments and Bioplastics, vaccines, Diagnostic tools and kits.

Suggested Readings:

1. Srilakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2. Srilakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3. Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4. Gopalan.C.,RamaSastry B.V., and S.C.Balasubramanian (2009), Nutritive value of Indian Foods.NIN.ICMR.Hyderabad.
5. Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 mark

IV-Semester
Microbial Entrepreneurship

Course Code: MBL:104 DCS -4T **CIA Marks :40**
Teaching Hrs :56 **SEE Marks :60**
Scheme : **Credit : 04**

Course Objectives: The course will enable the students to

1. Differentiating concepts of chemoheterotrophic metabolim and chemolithotrophic metabolism.
2. Describing the enzyme kinetics, enzyme activity and regulation.
3. Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms

UNIT I : Metabolism of Carbohydrates **14hrs**

Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation
Concept of aerobic respiration, anaerobic respiration and fermentation. Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, Phosphoketolase pathway. TCA cycle.
Fermentation - Fermentation balance, concept of linear and branched fermentation pathways. Fermentation pathways: Alcohol fermentation and Pasteur effect; Butyric acid and Butanol^Acetone Fermentation, Mixed acid and 2,3-butanediol fermentation, Propionic acid Fermentation (Succinate pathway and Acrylate pathway), acetate FermentationChemolithotrophic Metabolism:Chemolithotrophy - Hydrogen oxidation, Sulphur oxidation, Iron oxidation, Nitrogen oxidation.
Anaerobic respiration with special reference to disimilatory nitrate reduction and sulphate reduction.

UNIT II: Metabolism of aminoacids, nucleotides and lipids **14hrs**

1. Nitrogen Metabolism : Introduction to biological nitrogen fixation Ammonia assimilation. Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification
2. Biosynthesis of ribonucleotides and deoxyribonucleotides. The de novo pathway. Regulation by feedback mechanisms. Recycling via the salvage pathway
3. Amino acid degradation and biosynthesis
4. Lipid degradation and biosynthesis
5. Metabolism of one carbon compounds:Methylotrophs :
   i. Oxidation of methane, methanol, methylamines;
   ii. Carbon assimilation in methylotrophic bacteria and yeasts Methanogens:
   i. Methanogenesis from H2, CO2, CHOH, HCOOH, methylamines;
   ii. Energy coupling and biosynthesis in methanogenic bacteria
   Acetogens: Autotrophic pathway of acetate synthesis
6. Metabolism of two-carbon compounds:Acetate: i. Glyoxylate cycle. Acetic acid bacteria: Ethanol oxidation, sugar alcohol oxidation. Glyoxylate and glycolate metabolism:i. Dicarboxylic acid cycle, ii. Glycerate pathway iii. Beta hydroxyaspartate pathway Oxalate as carbon and energy source

UNIT III : Basics of Enzymes **14hrs**

Definitions of terms – enzyme unit, specific activity and turnover number, exo/ endoenzymes, constitutive/ induced enzymes, isozymes. Monomeric, Oligomeric and Multimeric enzymes. Multienzyme complex: pyruvate dehydrogenase; isozyme: lactate dehydrogenase. Ribozymes, abzymes

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme, NAD, metal cofactors.

Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis and Induced Fit hypothesis. Multisubstrate reactions -Ordered, Random, Ping-pong.

Enzyme catalysis:Catalytic mechanisms with type examples, catalytic mechanisms and testing - Serine proteases and Lysozyme

UNIT IV : Enzyme Kinetics and Regulation **14hrs**

Enzyme Kinetics: Kinetics of one substrate reactions. i. Equilibrium assumptions ii. Steady state assumptions iii. Lineweaver-Burk, Hanes-Woolf, Eadie-Hofstee equations and plots. Kinetics of enzyme inhibition. Competitive, non-competitive and uncompetitive inhibition. Effect of changes in pH and temperature on enzyme catalysed reaction.Kinetics of two substrate reactions. Pre steady state kinetics. Kinetics of immobilized enzyme

Enzyme regulation : Allosteric enzyme - general properties, Hill equation, KoshlandNemethy and Filmer model, Monod Wyman and Changeux model. Covalent modification by various mechanisms. Regulation by proteolytic cleavage - blood coagulation cascade. Regulation of multiˆenzyme complex- Pyruvate dehydrogenase. Feedback inhibition.HIV enzyme inhibitors and drug design

Mapping of CO with PO and PSO:

CO. PO												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Differentiating concepts of chemoheterotrophic metabolim and chemolithotrophic metabolism		✓						✓			✓	
Describing the enzyme kinetics, enzyme activity and regulation.		✓						✓			✓	
Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms		✓						✓			✓	

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 mark

IV-Semester

Microbial Enzymology and Metabolism

Course Code: MBL-104-DSC-4P **CIA Marks :25**
Teaching Hrs : **SEE Marks :25**
Scheme : **Credit : 02**

Course Content

1. Handling of micropipettes and checking their accuracy
2. Isolation of cholesterol and lecithin from egg yolk
3. Identification of fatty acids and other lipids by TLC/GC
4. Determination of degree of unsaturation of fats and oils
5. Isolation of lactose from bovine milk
6. Estimation of total sugars by the phenol-sulphuric acid method
7. Estimation of DNA - DPA method & UV absorbance method
8. Estimation of RNA (Orcinol method)
9. Isolation of glutamic acid from gluten
10. Determination of molar absorption coefficient (e) of l-tyrosine
11. Determination of the isoelectric point of the given protein
12. Estimation of polyphenols/ tannins by Folin- Denis method
13. Chemotaxis of Pseudomonas
14. Demonstration of alcoholic fermentation
15. Effect of variables on enzyme activity (amylase): a. Temperature b. pH c. substrate concentration d. Enzyme concentration e. Determination of Km of amylase (Lineweaver-Burke plot; Michaelis-Menton graph)

References :

1. Philipp. G. Mannual of Methods for General Bacteriology.
2. David T. Plummer. An Introduction to Practical Biochemistry
3. Biochemistry- A Problem Approach, Wood W. B. Wilson J.H., Benbow R.M. and Hood L.E.2nd ed., 1981, The Benjamin/ Cummings Pub.co
4. Biochemical calculations, Segel I.R., 2nd ed., 2004, John Wiley and Sons
5. Biochemical Calculations, Irwin H. Segel, 2nd Edition John Wiley & Sons

Formative assessment		Summative Assessment	Total Marks
Assessment Occasion / type	**Weightage in Marks**	**Practical Exam**	
Record	5	25	50
Test	10		
Attendance	5		
Performance	5		
Total	**25**	**25**	

IV-Semester

Human Microbiome

Course Code: MBL:104 OE -4T **CIA Marks :40**
Teaching Hrs : **SEE Marks :60**
Scheme : **Credit : 03**

Course Objectives: The course will enable the students to

1. Articulate a deeper understanding on biological complexities of human micro biome.
2. Understand broader goals of biological anthropology.
3. Compare and contrast the microbiome of different human body sites and impact human health promotion

UNIT I : INTRODUCTION TO MICROBIOME **14hrs**

Evolution of microbial life on Earth, Symbiosis host-bacteria . Microbial association with plants and animals, Symbiotic and parasitic, Normal human microbiota and their role in heatlh. Microbiomes other than digestive system.

UNIT II: MICROBIOMES AND HUMAN HEALTH **14hrs**

Microbiome in early life, Nutritonal modulation of the gut microbiome for metabolic health- role of gut mocrobiomes in human obesity, human type 2 diabetes and longevity. Probiotics-Criteria for probiotics, Development of Probiotics for animal and human use; Pre and synbiotics. Functional foods-health claims and benefits, Development of unctional foods.

UNIT III : CULTURING OF MICROBES FROM MICROBIOMES **14hrs**

Culturing organisms of interest from the microbiome : bacterial, archaeal, fungal, and yeast, viral. Extracting whole genomes from the microbiome to study microbiome diversity Microbiomes and diseases: Microbiome and disease risks: The gut microbiome and host immunity, bacteriocins and other antibacterials. Human microbiome research in nutrition.

References :

1. Fundamentals of Microbiome Science – how microbes shape animal biology, Princeton University Press, New Jersey, United States. Rob DeSalle and Susan L. Perkins (2015).
2. Welcome to the microbiome. getting to know the trillions of bacteria and other microbes in, on, and around you. Yale University Press. Suggested Readings Rodney Dietert (2016).
3. The Human Superorganism: how the microbiome is revolutionizing the pursuit of a healthy life. Dutton Books. Justin Sonnenburg and Erica Sonnenburg (2014).
4. The good gut: taking control of your weight, your mood, and your long-term health. Penguin Press. Emeran Mayer (2016).
5. The Mind-Gut Connection: How the Astonishing Dialogue Taking Place in Our Bodies Impacts Health, Weight, and Mood. eBook, Harper Wave Books. Martin J. Blaser (2014).
6. Cox, L.M., et al., Altering the intestinal microbiota during a critical developmental window has lasting metabolic consequences. Cell, 2014. 158(4): p. 705-21.
7. Douglas, A., Fundamentals of Microbiome Science: How Microbes Shape Animal Biology. 2018, 41 William Street, Princeton, New Jersey 08540: Princeton University Press.
8. HMP, C., Structure, function and diversity of the healthy human microbiome. Nature, 2012. 486(7402):p. 207-14.

9. Diaz Heijtz, R., et al., Normal gut microbiota modulates brain development and behavior. Proc Natl Acad Sci U S A, 2011. 108(7): p. 3047-52.
10. Sonnenburg, E.D., et al., Diet-induced extinctions in the gut microbiota compound over generations. Nature, 2016. 529(7585): p. 212-5.
11. Zou, J., et al., Fiber-Mediated Nourishment of Gut Microbiota Protects against Diet-Induced Obesity by Restoring IL-22-Mediated Colonic Health. Cell Host Microbe, 2018. 23(1): p. 41-53 e4.
12. Yassour, M., et al., Strain-level analysis of mother-to-child bacterial transmission during the first few months of life. Cell Host Microbe, 2018. 24(1): p. 146-154 e4. Microbiomes and Health – 11:680:475
13. Dominguez-Bello, M.G., et al., Partial restoration of the microbiota of cesarean-born infants via vaginal microbial transfer. Nat Med, 2016. 22(3): p. 250-3.
14. Moeller, A.H., et al., Rapid changes in the gut microbiome during human evolution. Proc Natl Acad Sci U S A, 2014. 111(46): p. 16431-5.
15. Prescott's Microbiology, 11th EditionBy Joanne Willey and Kathleen Sandman and Dorothy Wood
16. Henderson Gemma et al. (2015), Rumen microbial community composition varies with diet and host, but a core microbiome is found across a wide geographical range, Scientific Reports,
17. Salle, A.J. (1992). Fundamental Principles of Bacteriology. 7th Edition, Mc. Graw Hill Publishing Co. Ltd., NewYork

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Case Studies	10
Test	10
Total	60 marks + 40 marks = 100 mark

DEPARTMENT OF ELECTRONICS
SEMESTER-III
PROGRAMMING IN C AND ANALOG COMMUNICATION

Course Code: 121DSC03T **CIA Marks :40**
Teaching Hrs : 60 **SEE Marks :60**
Credit : 04 **Total : 100**

Course Objectives: The course will enable the students to

1. Learn good coding techniques required for current industrial practices.
2. Gain the knowledge of programming the system using C programming language.
3. To understand the communication system, Principle and working communication system, means and medium of communication.
4. To understand the Principle and working of different modulation techniques.

Course Outcome: Students will able to

CO1. Design and analyze algorithms for solving simple problems.
CO2. Write and execute and debug C codes for solving problems.
CO3. Know the basic concept of Analog Communication, means and medium of communication.
CO4. Understand the principle of Analog and digital modulation.
CO5. Familiar with "AM" and "FM "techniques.
CO6. Understand the basic concept of Pulse Modulation, Carrier Modulation for digital transmission and able to construct simple pulse modulation.

Course Content

UNIT-I: **15hr**

C Programming : Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants, basic data types, variables: declaration & assigning values. Structure of C program Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators.

Arrays: Basics of arrays, declaration, accessing elements, storing elements, two-dimensional and multi- dimensional arrays. Input output statement – sprintf(), scanf() and getch(), and library functions (math and string related functions).

UNIT –II: **15 hours**

Decision making, branching, and looping: if, if-else, else-if, switch statement, break, for loop, while loop and do loop.

Functions: Defining functions, function arguments and passing, returning values from functions, example programs.

Pointers: Pointer declaration, assigning values to pointers, pointer arithmetic, array names used as pointers, pointers used as arrays, pointers and text strings, pointers as function parameters.

Structures: Structure type declarations, structure declarations, referencing structure members, referencing whole structures, initialization of structures, structure bit fields

Unit-3 : **15 hours**

Electronic communication : Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

Propagation of "EM" Wave: Introduction, Loss of "EM" Energy due to noise, Ground Wave, Sky-wave and Space-wave propagation. Ionosphere and its effects.

Communication medium: Transmission lines, coaxial cables, wave guides and optical fibres.

Antenna: Introduction, Antenna parameters, Ferrite rod antenna, yagi-Uda antenna, Dish-antenna, principle, Working and applications only

Unit-4 : **15 hours**

Analog Modulation: Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver.

Analog Pulse Modulation: Channel capacity, sampling theorem, Basic Principles- PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing

REFERENCE BOOKS :

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis," 2nd Edition, Prentice Hall PTR, 2006.
2. E. Balagurusamy, "Programming in ANSI C", 4th Edition, Tata McGraw-Hill, 2008.
3. Donald E. Thomas, Philip R. Moorby, "The Verilog Hardware Description Language", 5th Edition, Springer, 2002.
4. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
5. Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
6. Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
7. K.D Prasad, "Antenna and Wave Propagation", Satyaprakashan, New Delhi.
8. Sanjeev Gupta, "Electronic Communication Systems", Khanna Publishers, New Delhi.
9. Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
10. Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill

III-Semester

Programming in C and Digital Design using Verilog (Practical)

Course Code : 121DSC03P **CIA Marks : 25**
Teaching Hrs : 40 **SEE Marks : 25**
Credit : 02 **Total : 50**

Part -A: Programming in C Laboratory :

1. Find the area and circumference of a circle
2. Find the biggest and smallest elements in a series
3. Find the factorial of a given number
4. Check the prime number in a series
5. Find the roots of quadratic equation
6. Find the gross salary of an employee
7. Remove all vowels from a string
8. Upper case and lower-case conversion and vice-versa
9. Reverse a string using library functions
10. Reverse a string without using library
11. Check whether the string is palindrome or not
12. Arrange the array in ascending and descending order using bubble sort
13. To perform arithmetic operations for a matrix.
14. Display prime numbers between intervals 0 to 100
15. Find GCD of two numbers.

Part – B : Analog communication

1. Construct amplitude modulator using transistor / I. C. Determination the modulation index.
2. Construct frequency modulator circuit – determine the modulation index.
3. "AM" Liner Diode detector- trace the input and output waveforms.
4. Frequency mixer circuit – Verify output frequency for different input frequencies.
5. "FM" Detector – Plot the frequency response curve.
6. Study of Balanced demodulator
7. Study of IF amplifier circuit.
8. Pulse amplitude modulation (PAM) – trace the output waveforms.
9. Pulse width modulation (PWM) – trace the output waveforms.
10. Pulse position modulation (PPM) – trace the output waveforms.
11. Characteristics of LED in OFC
12. Study of Numerical aperture
13. Study of OFC losses.
14. Setting up simple OFC Link.

DEPARTMENT OF ELECTRONICS
SEMESTER-III
PROGRAMMING IN C AND ANALOG COMMUNICATION

Course Code: 1210EC03T **CIA Marks :40**
Teaching Hrs : 45 **SEE Marks : 60**
Credit : 03 **Total : 100**

Course Content

UNIT-I: **10hrs**

Fundamental Electronics : Amplifiers, Frequency response, signal generation. Different types of transducers & their selection for biomedical applications. Electrode theory, selection criteria of electrodes & different types of electrodes Bio electric amplifiers

UNIT –II: **10hrs**

Introduction to Bio-medical instruments : Origin of bio-electric signals, active & passive transducer for medical application –Electrocardiography-waveform-standard lead systems, typical ECG amplifier, EEG electrode, recording systems, EMG basic principle-block diagram of a recorder.

Unit-3 : **15 hours**

Medical Imaging : Nature and production od X-rays, Improving X-ray images, Computerised axial tomography, Using ultrasound in medicine, Ultrasound scanning, Magnetic resonance imaging PET and SPECT Imaging

Unit-4 : **15 hours**

Biomedical Signal Processing: Fundamentals of signal processing, digital image, transforming image, image enhancement, image Segmentation, image compression, image restoration and reconstruction of medical images. Demonstration using MATLAB

REFERENCE BOOKS :

1. L Cromwell, F J Weibell, Eapfeiffer, Biomedical Instrumentation and measurements, PHI Publications.

ELECTRONICS
SEMESTER-IV
VERILOG AND COMMUNICATION SYSTEMS

Course Code: 121DSC04T **CIA Marks :40**
Teaching Hrs : 60 **SEE Marks :60**
Credit : 04 **Total : 100**

Course Objectives: The course will enable the students to

1. The ability to code and simulate any digital function in Verilog HDL.
2. Know the difference between synthesizable and non-synthesizable code.
3. Understand library modelling, behavioural code and the differences between simulator algorithms and logic verification using Verilog simulation.
4. Will be able to differentiate between analog and digital communication.
5. To understand the Principle and working of Satellite and optical fibre communication.

Course Outcome: Students will able to

CO1. Apply the acquired knowledge of digital circuits in different levels of modelling using Verilog HDL.
CO2. Apply the acquired knowledge of digital circuits in different levels of modelling using Verilog HDL.
CO3. Design and verify the functionality of digital circuit/system using test benches.
CO4. Develop the programs more effectively using directives, Verilog tasks and constructs.
CO5. Understand the basic concept of Satellite Communication
CO6. Understand the basic concept of Optical Fibre Communication

Course Content :

UNIT-I: **15hr**

Overview of Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL flow, Trends in HDLs.

Hierarchical Modelling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block, Lexical conventions. Data types, system tasks, compiler directives.

Modules and Ports: Module definition, port declaration, connecting ports, hierarchical name referencing.

Gate-Level Modelling : Modelling using basic Verilog gate primitives, Description of and/or and buf/not type gates, Rise, fall and turn-off delays, min, max, and typical delays. Combinational logic circuit design using Gate level modeling

UNIT –II: **15 hours**

Dataflow Modelling: Continuous assignments, delay specification, expressions, operators, operands, operator types.

Behavioral Modelling: Structured procedures, initial and always, blocking and non-blocking statements. Delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.

Tasks and functions: Differences between tasks and functions, declaration, invocation, automatic tasks and functions. Combinational and sequential logic circuit design using all three modeling

UNIT–III: **15 hours**

Satellite Communication : Introduction, Evolution and growth of communication satellite, Satellite orbits, linkages, assignable satellite frequencies, equipment on satellite, propagation of signals, path loss, the ground station, special purpose satellite, DBS, INMARSAT, INTELSAT, VSAT, MSAT, SARSAT, LANDSAT, Indian space centres and the Indian satellite system(INSAT),early activities of India in satellite communication

UNIT–IV: **15 hours**

Optical Fiber Communication: Optical Fibers: Structure and wave guides, fundamentals, Nature of light, basic optical laws and definitions, optical fiber types, Rays and modes, ray optics. Signal degradation in optical fibers, attenuation, scattering losses, radiative losses, absorption losses, and core and cladding losses, signal distortion in optical wave guides, group delay, dispersion, and pulse broadening in graded index wave guide.

Optical sources: LEDs, structure, source materials, Laser diodes: Structures, threshold conditions, modal properties and radiation patterns

Optical Receiver Operations: Fundamental receiver operations, digital signal transmission, receiver noise, analog receivers.

Reference Books:

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis," 2nd Edition, Prentice Hall PTR, 2006.
2. E. Balagurusamy, "Programming in ANSI C", 4th Edition, Tata McGraw-Hill, 2008.
3. Donald E. Thomas, Philip R. Moorby, "The Verilog Hardware Description Language", 5th Edition, Springer, 2002.
4. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", 2nd Edition, Pearson Education, 2010.
5. Padmanabhan, Tripura Sundari, "Design through Verilog HDL", Wiley Eastern, 2016.
6. Nazeih M. Botors, "HDL Programming VHDL and Verilog", 1st Edition, Dreamtech Publication, New Delhi, 2006.
7. Gupta and Kumar, "Handbook of Electronics"-32nd Edition, Pragati prakashan, Meerut, 2004
8. Dennis Roddy and John Coolean, "Electronics Communication"-4th edition, Pearson publication
9. Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press
10. Gerd Keiser, "Optical Fibre Communication ", McGraw Hill, 3rd Edition.

IV - SEMESTER

Verilog and Communication Systems (Practical)

Course Code : 121DSC04P **CIA Marks :25**
Teaching Hrs : **SEE Marks :25**
Credit : 02 **Total : 100**

List of Experiment :

Write and execute Verilog code to realize

1. Realization of logic gates.
2. Encoder without priority and with priority.
3. Multiplexer, De-multiplexer.
4. Comparator, Code converters – Binary to Gray and vice versa.
5. Adder/Subtractor (Half and Full) using different modelling styles.
6. 4-bit parallel adder and 4-bit ALU/8-bit ALU.
7. SR, D, JK, T-flip-flops.
8. To realize counters: Up/Down (BCD and Binary).
9. 4-bit Binary counter, BCD counters (Synchronous reset) and any arbitrary sequence counters.
10. 4-bit Binary counter, BCD counters (Asynchronous reset) and any arbitrary sequence counters. Modelling of Universal shift registers.

DEPARTMENT OF COMPUTER SCIENCE
III - SEMESTER
Object Oriented Programming using JAVA (DSC)

Course Code : 033CSC011 **CIA Marks :40**
Teaching Hrs : 52 **SEE Marks :60**
Credit : 04 **Total : 100**

Course Objectives: The course will enable the students to

CO 1: Explain the object-orieted concepts using JAVA.
CO 2: Write JAVA programs using OOP concepts like Abstraction, Encapsulation, Inheritance and Polymorphism.
CO 3: Implement Classes and multithreading using JAVA.
CO 4: Demonstrate the basic principles of creating Java applications with GUI.

Course Content

Unit- 1 : Introduction to OOPS : OOPS concepts, Four pillars of OOPS, Advantages of OOPS, Introduction to Spring & Hibernate.

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java. **13**

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.

Unit-2 : Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package. **13**

Unit- 3 : Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Exceptional handling mechanism **13**

Unit-4 :I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming. **13**

Suggested Readings:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

B. Sc Semester-III
Java Labs (Practical)

Course Code : DSC-CS-303-P **CIA Marks :25**
Teaching Hrs : 52 **SEE Marks :25**
Credit : 02 **Total : 50**

List of Experiments :

Operators, Decision making and Loops :

1. Write a Java program to read the radius of a circle and to find the area and circumference.
2. Write a program to demonstrate String Operators
3. Write a Java program to find N prime numbers reading N as command line argument.
4. Write a program to find factorial of N numbers reading N as command line argument.
5. Write a program to read N numbers and sort them using one-dimensional arrays.

Classes and Methods:

6. Write a Java program to illustrate Method Overloading.
7. Write a Java program to illustrate Operator Overloading.
8. Write a program to demonstrate Single Inheritance.
9. Write a program to illustrate Constructor Overloading
10. Write a program to illustrate Method Overriding

Packages, Threads and Exception Handling:

11. Write a Java program demonstrating Multithreading.
12. Write a Java program demonstrating Exception Handling.
13. Write a Java program to demonstrate user defined package program.

Java Applet Programming

14. Write an Applet program to display Geometrical Figures using objects.
15. Write an Applet program which illustrate Scroll bar object.
16. Write an Applet program to change the background color randomly.
17. Write an Applet program to change the color of applet using combo box.
18. Write an Applet program to implement Digital Clock using thread

Event Handling:

19. Write an Applet program to implement Mouse events.
20. Write an Applet program to implement Keyboard events.

General Instructions

Implement all programs using JAVA.

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

1. 7 Marks (Writing Program 1 + Execution without error)
2. 7 Marks (Writing Program 2 + Execution without error)
3. Viva 6 marks
4. Journal 5 Marks

Total 25 Marks

III - SEMESTER
Python Programming Concepts (OEC)

Course Code : 003CSC051 **CIA Marks : 40**
Teaching Hrs : 42 **SEE Marks : 60**
Credit : 03 **Total : 100**

Course Objectives: The course will enable the students to

CO 1: Explain the fundamentals of Computers.
CO 2: Explain the basic concepts of Python Programming.
CO 3: Demonstrate proficiency in the handling of loops and the creation of functions.
CO 4: Identify the methods to create and store strings.

Unit- 1 :Fundamentals of Computers Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer ;
Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples. **11**

Unit-2 : Python Basics : Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions-Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative programs. **10**

Unit-3 : Python Control Flow : Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs. **11**

Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs.

Unit-4 : Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; - Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative programs. **10**

Suggested Readings:

1. Computer Fundamentals (BPB), P. K. Sinha &Priti Sinha
2. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online 2015. @https://www.greenteapress.com/thinkpython/thinkCSpy.pdf
3. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
4. http://www.ibiblio.org/g2swap/byteofpython/read/
5. http://scipy-lectures.org/intro/language/python_language.html
6. https://docs.python.org/3/tutorial/index.html

B. Sc Semester-III
Java Labs (Practical) SEC-II

Course Code : 033CSC061 **CIA Marks :25**
Teaching Hrs : 39 **SEE Marks :25**
Credit : 02 **Total : 50**

Course Outcomes (COs): At the end of the course, students will be able to:

CO 1: Appraise the theory of Artificial intelligence and list the significance of AI.

CO 2: Discuss the various components that are involved in solving an AI problem.

CO 3: Illustrate the working of AI Algorithms in the given contrast.

CO 4: Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.

CO 5: Apply the AI concepts to build an expert system to solve the real-world problems.

Unit - I **5hr**

Overview of AI : Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI.

Intelligent Systems: Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.

Unit - II **5hr**

AI Applications: Virtual assistance, Travel and Navigation, Education and Healthcare, Optical character recognition, E-commerce and mobile payment systems, Image based search and photo editing.

AI Examples in daily life: Installation of AI apps and instructions to use AI apps.

Unit-III **3hr**

Robotics: Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.

Laboratory Activities:

- Amazon Alexa: https://play.google.com/store/apps/details?id=com.amazon.dee.app&hl=en&gl=US
- Google Lens: https://play.google.com/store/search?q=google+lens&c=apps&hl=en&gl=US
- Image to Text to Speech ML OCR: https://play.google.com/store/apps/details?id=com.mlscanner.image.text.speech&hl=en_IN&gl=US
- Google Pay: https://play.google.com/store/apps/details?id=com.google.android.apps.nbu.paisa.user&hl=en_IN&gl=US
- Grammarly: https://play.google.com/store/search?q=grammarly&c=apps&hl=en_IN&gl=
- Google Map: https://play.google.com/storesearch?q=google+maps&c=apps&hl=en&gl=US
- FaceApp: https://play.google.com/store/apps/details?id=io.faceapp&hl=en_IN&gl=US
- Socratic: https://play.google.com/store/apps details?id=com.google.socratic&hl=en_IN&gl=US

- Google Fit: Activity Tracking: https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en_IN&gl=US
- SwiftKey Keyboard: https://swiftkey-keyboard.en.uptodown.com/android
- E-commerce App: https://play.google.com/store/apps details?id=com.jpl.jiomart&hl=en_IN&gl=US

Text Book :

1. Wolfgang Ertel, "Introduction to Artificial Intelligence", 2nd Edition, Springer International Publishing 2017.
2. Michael Negnevitsky, "Artificial Intelligence A Guide to Intelligent Systems", 2nd Edition, Pearson Education Limited 2005.

References:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf
2. Kevin Knight, Elaine Rich, Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, July 2017.

Reference Links :

1. Voice Assistant: https://alan.app/blog/voiceassistant-2/
2. Browse with image: https://www.pocket-lint.com/apps/news/google/141075-what-is-google-lens-and-how-does-it-work-and-which-devices-have-it
3. OCR: https://aws.amazon.com/what-is/ocr/
4. Mobile Payment system: https://gocardless.com/en-us/guides/posts/how-do-mobile-payment-systems-work/
5. Grammarly: https://techjury.net/blog/how-to-use-grammarly/#gref
6. Travel & Navigation: https://blog.google/products/maps/google-maps-101-ai-power-new-features-io-2021/
7. AI in photo editing: https://digital-photography-school.com/artificial-intelligence-changed-photo-editing/
8. AI in education: https://www.makeuseof.com/what-is-google-socratic-how-does-it-work/
9. AI in health and fitness: https://cubettech.com/resources/blog/implementing-machine-learning-and-ai-in-health-and-fitness/
10. E-commerce and online shopping: https://medium.com/@nyxonedigital/importance-of-e-commerce-and-online-shopping-and-why-to-sell-online-5a3fd8e6f416

Implement Laboratory activitiesas specified tools in the SEC-3.

Implement all programs using JAVA.

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

1. 7 Marks (Writing Activity 1 + Execution without error)
2. 7 Marks (Writing Activity 2 + Execution without error)
3. Viva 6 marks
4. Journal 5 Marks

Total 25 Marks

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions: 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions: 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions:30 marks

   (Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total : 60 marks

Details of Formative Assessment (IA) for DSC theory/OEC: 40% weight age for total marks

Type of Assessment	**Weight age**	**Duration**	**Commencement**
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	------	--
Total	40% of the maximum marks allotted for the Paper		

DEPARTMENT OF COMPUTER SCIENCE
SEMESTER IV
Database Management Systems (DSC)

Course Code : 034CSC011 **CIA Marks :40**
Teaching Hrs : 52 **SEE Marks :60**
Credit : 04 **Total : 100**

Course Objectives: The course will enable the students to

CO 1: Explain the various database concepts and the need for database systems.

CO 2: Identify and define database objects, enforce integrity constraints on a database using DBMS.

CO 3: Demonstrate a Data model and Schemas in RDBMS.

CO 4: Identify entities and relationships and draw ER diagram for a given real-world problem.

CO 5: Convert an ER diagram to a database schema and deduce it to the desired normal form.

CO 6: Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.

CO 7: Explain the transaction processing and concurrency control techniques.

Course Content :

Unit-1: Database Architecture : Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS **13hrs**

Unit-2: E-R Model: Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities.

Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram **13hrs**

Unit-3 :Relational Data Model : Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values. Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views. Introduction to PL/SQL & programming of above operations in PL/SQL. **13hrs**

Unit- 4 : Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.

Query Processing Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering. Deadlock & Starvation.

Error Handling mechanism : Exception definition, Difference between error and exception, Types of exceptions, Advantages of exception handling. Stored Procedure & Triggers : SP Definition, Types of stored procedures, Advantages of Stored procedure. Triggers definition, Types of Triggers, Uses of triggers. **13hrs**

Suggested Readings:

1. Fundamentals of Database Systems, RamezElamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

B. Sc Semester-IV
Database Management Systems Lab (Practical)

Course Code : 034CSC012 **CIA Marks : 25**
Teaching Hrs : 52 **SEE Marks : 25**
Credit : 02 **Total : 50**

Course Outcomes (COs): At the end of the course, students will be able to:

CO: Student would be able to create a tables, execute queries and PL/SQLprograms.

List of Experiments :

Date base - 1 : EMPLOYEE

Consider the following relations for Employee database application.

EMPLOYEE (Empno, Name, Dept_ID, DOJ, City)

DEPARTMENT (Dept_ID, Name, Manager)

Salary (Empno, Basic, HRA, Deductions, Tax, Net_Pay)

a. Create the above tables by properly specifying the primary key.
b. Enter at least five tuples for each relation.
c. Execute the following queries (SQL)
    1. Find out the Employees who have the same date of joining.
    2. Get Department ID, the average, maximum, and minimum basic pay of all departments having more than two employees.
d. Write PL/SQL procedure to insert a new row (INSERT INTO command).

Database - 2 : Company

Consider the following relations for company database application

EMPLOYEE (Adhar_no, Name, Address, Sex, Salary, DNo)

DEPARTMENT (DNo, DName, Mgr_Adharno, MgrStartDate)

DLOCATION (DNo,DLoc)

PROJECT (PNo, PName, PLocation, DNo)

WORKS_ON (Adhar_no,PNo, Hours)

a. Create the above tables by properly specifying the primary key.
b. Enter At least five tuples for each relation.
c. Execute the following queries (SQL)
    1. Make a list of all project numbers for projects that involve an employee whose last name is 'Smith', either as a worker or as a manager of the department that controls the project.
    2. Retrieve all Employees in department 5 whose salary is between 30000 and 40000.
d. Write PL/SQL program to demonstrate %ROWCOUNT attribute.

Database -3: Insurance

Consider the following relations for an accident recording database application

PERSON (Driverid :String, name:String, Address: String)

CAR (Regno: String, Model(Company): String,Year: int)

ACCIDENT (Reportno :Number, Date: Date, Location: String)

OWNS (Driverid: String, Regno: String)

PARTICIPATED (Driverid:String, Regno:String,
Reportno:Number,Damageamount:integer)

a. Create the above tables by properly specifying the primary key.
b. Enter At least five tuples for each relation.
c. Execute the following queries (SQL)
    1. Demonstrate how to update the damage amount for the car with a specific regno.
    2. List the drivers (name, address & damage amt) who have participated in an accident.
d. Write PL/SQL program demonstrate exception handling for the above query 2.

Database - 4: COMPANY (SHIPMENT)

Consider the following relations for an order processing database application in a company

CUSTOMER (Customerno:Integer,Customername:String,City:String)

ORDER (Orderno:integer,orderDate:date,customerno:int,Orderamount:dec)

ITEM (Itemno:int,unitprice:decimal)

ORDERITEM (Orderno:int,Itemno:int,Quantity: int)

WAREHOUSE (Warehno:int,City:String)

SHIPMENT (Orderno:int,Warehno:int,Shipdate:Date)

a. Create the above tables by properly specifying the primary key
b. Enter At least five tuples for each relation.
c. Execute the following queries (SQL)
    1. List the item no, unit price, quantity and total price for a particular order no.
    2. List the customer name, city, order number and order amount for a particular customer.
d. Write PL/SQL procedure to illustrate, how to create and call a function.

Database - 5 : STUDENTS, COURSES & BOOK ISSUED

Consider the following relations for Student, courses & Book issued database.

STUDENT (Regno:String, Name:String; Major:String; Bdate:Date)

COURSE (Courseno:Integer, Cname:String; Dept:String)

ENROLL (Regno:String; Courseno;integer; Semester:Integer: Marks:int)

BOOKADOPTION (Courseno:Integer ;Semester:Integer;BookISBN:Int)

TEXT (Book ISBN:Int; Book Title: String; Publisher: String; Author: string)

a. Create the above tables by properly specifying the primary key.
b. Enter At least five tuples for each relation.
c. Execute the following queries (SQL)

1. Produce a list of textbooks with Book ISBN, Title, publisher, author, course name and course number adopted by some course.
2. List the name, major, course name, semester and the marks obtained by a particular student.

d. Write PL/SQL procedure to demonstrate user defined exception handling

Database -6 : BOOK DEALER

Consider the following relations for a database application for a Book Dealer

AUTHOR (Authorid int, Name:String, City:String,Country:String)

PUBLISHER (Publisherid:int, Name:String, City:String, Country:String)

CATALOG (Bookid:int, Title:String, Authorid int, Publisherid:int,Categoryid: int,Year:int, Price:int)

CATEGORY (Categoryid: int, Description:String)

ORDER DETAIL (Oredrno:int, Bookid:int, Quantity:int)

a. Create the above tables by properly specifying the primary key.

b. Enter At least five tuples for each relation.

c. Execute the following queries (SQL)

1. Demonstrate how to increase the price of the book published by a specific publisher by 10%.
2. Display the title of the book having maximum sales.

d. Write PL/SQL program to demonstrate Implicit/Explicit cursor.

Database - 7 : BANK

Consider the following relations for a Bank database application

BRANCH (BranchID: integer, Branchname: String, Branchcity:String, Assets:Real)

ACCOUNT (Accno:Int, BranchID:Integer, Balance:Real)

CUSTOMER (AccountNo: Integer,Customername:String, CustomerCity:String)

LOAN (Loano:Integer, BranchID : Integer, Amount:Real)

BRROWER (AccountNo: Integer, Loano:Integer)

a. Create the above tables by properly specifying the primary key.

b. Enter At least five tuples for each relation.

c. Execute the following queries (SQL)

1. List the names of the customers with their Loan Amount who have taken loan from the main branch (in any city).
2. Find all the customers who have accounts at the main branch.

d. Write PL/SQL Procedure for an application using package.

General Instruction

Implement all programs using JAVA.

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

1. 7 Marks (Writing Activity 1 + Execution without error)
2. 7 Marks (Writing Activity 2 + Execution without error)
3. Viva 6 marks
4. Journal 5 Marks **Total 25 Marks**

III - SEMESTER
Python Programming Concepts (OEC-4)

Course Code : 004CSC051 **CIA Marks :40**
Teaching Hrs : 42 **SEE Marks :60**
Credit : 03 **Total : 100**

Course Objectives: The course will enable the students to

CO 1: Compare how internet and other information t echnologies support business processes.
CO 2: Demonstrate an overall perspective of the importance of application of internet technologies in business administration
CO 3: Explain the basic business management concepts.
CO 4: Demonstrate the basic technical concepts relating to E-Commerce.
CO 5: Identify the security issues, threats and challenges of E-Commerce.

Unit- 1 :Introduction to E-Commerce and Technology Infrastructure **10**

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

Unit-2 : Building an E-Commerce Website, Mobile Site and Apps **10**

Systematic approach to build an E-Commerce: Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App.

Unit-3 : E-Commerce Security and Payment Systems **11**

E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems

Business Concepts in E-Commerce

Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce.

Unit-4 : Project Case Study **11**

Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project : Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart

Text Book :

1. Kenneth C. Laudon, Carol Guercio Traver - E-Commerce, Pearson, 10th Edition, 2016

References :

1. http://docs.opencart.com/
2. http://devdocs.magento.com/
3. http://doc.prestashop.com/display/PS15/Developer+tutorials
4. RobbertRavensbergen, -Building E-Commerce Solutions with Woo Commerce, PACKT, 2nd Edition

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions: 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions: 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions:30 marks

   (Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total : 60 marks

Details of Formative Assessment (IA) for DSC theory/OEC: 40% weight age for total marks

Type of Assessment	**Weight age**	**Duration**	**Commencement**
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	------	--
Total	40% of the maximum marks allotted for the Paper		

K. L. E. Society's
P. C. JABIN SCIENCE COLLEGE
Autonomous Vidyanagar, Hubballi - 31
CPE Phase - III
Re-Accredired by NAAC at 'A' Level with CGPA 3.43
MHRD-UBA-2.0 & IIC

STUDENTS' HAND BOOK

FOR
B.Sc. V & VI SEMESTER

2022-23

Name : _____

Class : _____ Division : _____ Reg No. : _____

STAFF LIST - 2022-23

PRINCIPAL

Dr. L. D. Horakeri, Associate Professor Physics & I/C Principal

DEPARTMENT OF PHYSICS

1 Shri S. V. Angadi Associate Prof.
2 Smt. L. C. Shidaganal Associate Prof.
3 Dr. Jagadeesha Angadi V. Assistant Prof.
4 Shri Veeresh G. Hiremath Assistant Prof.
5 Miss. Medha Deshpande Assistant Prof.
6 Dr. Rajesh Nairy K. Assistant Prof.
7 Dr. Veena E. Assistant Prof.
8 Smt. Sheela Gandhad, Lecturer

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6 Smt. Suma J. G. Assistant Prof.
7 Miss. Afra Quasar Nadaf Assistant Prof.
8 Shri Vinayak Chandrappa Barangi Assistant Prof.
9 Dr. (Smt). Padmeshewary R. Assistant Prof.
11 Shri Pavankumar H. Assistant Prof.
11 Miss. Roopali Chonchannavvar Lecturer

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4 Smt. Ganganmma Mokashi Lecturer
5 Smt. Vidya Pattanshetti Lecturer
6 Dr. Pallavi Mirajkar Lecturer
7 Miss. Pavitra Korishettar, Lecturer
8 Miss. Suvarna Jodatti, Lecturer

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5 Miss. Baby Benasamati Lecturer

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1 Dr.(smt) Sudha Patil Assistant Prof.
2 Smt. Sumangala B. Patil Assistant Prof.
3 Miss. Kiran V. Gargi Lecturer
4 Miss. Soumay Kundgol, Lecturer
5 Miss. Nisha Hosur Lecturer

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2 Shri B. Venkateshwar Lecturer
3 Miss. Shruti Hiremath Lecturer

DEPARTMENT OF ELECTRONICS

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2 Shri M. S. Sethsanadi Lecturer
3 Smt. Revati Poonja Lecturer
4 Shri Naveenrudda H. Tiligal Lecturer

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4 Dr. Sneha Chinnata, Lecturer
5 Dr. Jayaraj Chinchali Lecturer
6 Smt. Shruti M. Hugar, Lecturer

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2 Miss. Deepa Sonar Lecturer

DEPARTMENT OF ENGLISH

1 Dr. M. Y. Molekar, HOD
2 Dr. G. G. Patil, Assistant Professor

DEPARTMENT OF KANNADA

1 Smt. Anasuya Y. T., HOD
2 Miss. M. S. Jayshree Lagammanavar Lecturer

DEPARTMENT OF HINDI

1 Shri. S. A. Patil HOD

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1 Smt. Vijayalaxmi A. Shivanigi Librarian

SPORTS

1 Shir Prabhakarna T. Assistant Professor

NON-TECHING STAF

1. Shri Shreedar Chegaraddi, FDA
2. Shri N. C. Itagi, Superintendent
3. Smt. Rajani S. Nayak, FDA
4. Shri B. N. Jamakandi, SDA
5. Shri Mahaveer N. Devalapur, SDA
6. Shri M. S. Hiremeth, Lab Asst.
7. Shri S. M. Hospeti, Lab Asst.

EXAMINATION SECTION

1. Dr. L. D. Horakeri Principal
2. Shri Dheerendra V. Vadiraj, Controller of Examition
3. Miss. Lata Ichageri, F.D.A.
4. Miss. Shilpa Kallimani, FDA

PLACEMENT OFFICER

1 Smt. Sneha Sapare

KLE SOCIETY'S

P. C. JABIN SCIENCE COLLEGE,

AUTONOMOUS, CPE PHASE -III

AFFILIATED TO KARNATAK UNIVERSITY DHARWAD
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K.L.E Society's P. C. Jabin Science College Hubballi.

CALENDAR OF EVENTS FOR THE YEAR 2022-23 FOR B.Sc. / BCA *II, IV, & VI* SEMESTERS

MONTHS	WEEKS	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	NO OF WORKING DAYS	EVENTS
APR/MAY	I	09	10	11	12	13	14	15	05	COLLEGE REOPEN ON 10TH APRIL 14/04/23 DR. Ambedkar Jayanti VI SEMESTER CLASSES COMMENCES
	II	16	17	18	19	20	21	22	05	22/04/23 Idul Fitar 17/04/2023, II & IV SEMESTER CLASSES COMMENCES
	III	23	24	25	26	27	28	29	06	
	IV	30	01	02	03	04	05	06	05	01/05/23 **Labor's Day Week of Parent- teacher Meet**
	V	07	08	09	10	11	12	13	06	Week of B.O.S Meetings.
MAY/JUN	VI	14	15	16	17	18	19	20	06	Display of attendance report Department wise
	VII	21	22	23	24	25	26	27	06	**C1-Week of First IA Test**
	VIII	28	29	30	31	01	02	03	06	
	IX	04	05	06	07	08	09	10	06	
	X	11	12	13	14	15	16	17	06	Display of attendance report Department wise
JUN/JULY	XI	18	19	20	21	22	23	24	06	**C2-Week of Surprise Test**
	XII	25	26	27	28	29	30	01	05	29/06/23 Bakarid BOAE / BOE Meeting Submission of Panel of Examiners.
	XIII	02	03	04	05	06	07	08	06	**Week of Makeup Test** **Order to Examiners to set the Question paper**
	XIV	09	10	11	12	13	14	15	06	**C3-Completion of IIIrd Component.** **WEEK OF INTERNAL PRACTICALS**
JUL/AUG	XV	16	17	18	19	20	21	22	06	Week of Display of SEE Time table Week of submission of Exam application
	XVI	23	24	25	6	27	28	29	05	29/07/23 Moharum SUBMISSION OF CIA MARKS
	XVII	30	31	01	02	03	04	05	06	Display of attendance report Department wise 5th AUG is the last working day
TOTAL NUMBER OF WORKING DAYS									97	

- *Conduct of Assignments/ Viva/Seminars etc is as per the respective Department Calendar of events.*
- *Vacation: From 06/08/2023 to 24/09/2023.*
- *Semester end Practical Examination 08/08/2023 on wards.*
- *Semester end Theory Examination from 01/09/2023.on wards.*
- *Declaration of results 28/09/2023.*
- *Reschedule of events if any emergency holidays.*
- *College reopens on 25/09/2023.*

Principal
K. L. E. Society's P. C. Jabin Science College
Vidyanagar, Hubballi.
Karnataka - 580031.

Academic Calender of Events
2022-23

DEPARTMENT	September	October	November	December	January	February
PHYSICS	1.Bridge course for 1st sem students	1.Capacity building program 2.Display of teaching plan and lesson plan 3. Value added / certificate course enrollment	1.Study visit 2. Gender equity program 3.1st IA .	1.Guest Lecture 2. Extension activity 3. Peer tutoring 4.Study visit 5. 2nd IA	1.College level competitions 2. Make up test	1.Guest Lecture 2. Online International seminar / Conference
MATHS		1.Display of Teaching plan & lesson plan 2.Value added/certificate course enrollment	1.Faculty exchange programme 2.BOS meeting 3.Guest lecture 4.Display of attendance 5.1st IA 6.Students seminar	1.Workshop on JAM/Gate 2.Display of attendance 3.BOE meeting 4. 2nd IA 5.Quiz strife - 3	1. Make up test 2.Display of attendance 3.Display of consolidated marks	1.Submission of CIA marks 2.Curriculum feedback & analysis
CHEMISTRY	Bridge Course for Sem -1	1. Bridge Course for Sem -1. 2. Orientation Program for Sem -1. 3.BOS Meeting. 4. Display of Teaching plan & Lesson Plan. 5.Value added / CertificateCourse enrollment 6. Coaching for JAM/PGCET/other competitive exams	1. Selection of association secretaries. 2. Inauguration of chemical society. 3. Guest Lecture. 4. Display of attendance 5. 1st IA	1. Program for advanced learners. 2. Program for slow learners. 3.Display of Attandence 4. BOE meeting 5. 2nd IA	1. Industrial visits/Field visits/ Survey. 2. Make-up test 3.Extension activities 4. Display of attendance 5. Practical IA 6. Display of consolidated marks.	1. Submission of CIA marks. 2. Curriculim feedback analysis. 3. FDP

ZOOLOGY	1.Ozone day awareness programme	1.World animal welfare week celebration 2.Display of teachingplan & lesson plan 3.Value added /certificate course enrolment 4.Faculty development programme	1.Faculty exchange program. 2.BOS meeting 3Faculty exchange progeam 3.Displayof attendance 4. 1st IA	1.National pollution preventation Day 2.Display of attendance 3.BOE meeting 4. 2nd IA	1. Makeup test 2.Display of attendance 3.Display of conosolidated marks	1.Submission of CIA marks 2.Curriculum feedback& analysis
BOTANY		1.Departmental activities. 2.World Food Day(competition on food) 3.BoS meeting	1.Guest Lecture 2.V sem industrial visit		1.Guest Lecture	1.Field visit for BSc 1st, Vth & V1 th sem students
STATISTICS		1.Induction/Orientation programme. 2. Display of Teaching plan & Lesson Plan. 3. Value added / Certificate Course enrollment. 4. FDP on curriculum development.	1. Seminar /Workshop 2. BOS meeting. 3. Display of attendance. 4. Industrial visits/Field visits 5. 1st IA	1. Capacity development/ Skill enhancement activity. 2. Student /Faculty Exchange programme. 3. Displayof attendance 4. BoE meeting 5. 2nd IA	1. Extension activity 2. Makeup test. 3. Seminar / Workshop. 4. Display of attendance 5. Display of consolidated marks.	1. Submission of CIA. 2. Curriculum feedback & analysis.
ELECTRONICS			1.Technical talk	1. Association activity 2. Industry visit for students. 3.Enrichment program	1.Value added course commencement	1. Association activity

COMP-SCIENCE	1. Workshop 2. Quiz competition	1. Paper presentation. 2. Department Extension activity	1. Seminar 2. FDP		1.Technical talkon upcoming technology like AI/ Machine learning/IoT/ Ghat GPT 2. Project Domain& report. 3. Workshop for BSC VI sem.	1. Guest Lecture 2. FDP
BIOTECHNOLOGY/ MICROBIOLOGY		1. Workshop. 2.Career guidance -18th Oct,2022	1.Food fest 2.Guest lecture – world Diabetes DAy -14th Nov,2022	1.Industrial visit		1.National Science Day -28th Feb,2023 2. Model Making
PLACEMENT	1. Employable aptitude training 2.SAP LAB & Wipro campus drive	1. Employable aptitude training / Industry academia Collaboration 2.SAP LAB campus drive 3. Wipro campus drive	1.Atos off campus drive 2.Mindtree campus drive 3.Accenture campus drive 4.TCS campus drive	1.TCS campus drive	1.Nestle campus drive 2.Hexaware campus drive	
LIBRARY	1. Library Orientation Programme. 2.Conducting orientation on e-resources to PG students	1.Inviting an author from local area. 2.Enhancing reading skills among students	Talk on Competitive Exam. Talk on our Library E-resources	Talk on Collection of E-resources	Guest Lecture	----------
KANNADA	Guest Lecture for students	Organising various competitions for students	Organising various guest lectures for students	Organizing field visits for students	----------	----------
ENGLISH		1.BoS meeting 2.Display of	1.Inaugraution of Department Association	1.Capacity Development program	1.Intercollege competition for	1. Submission of CIA marks.

		teaching plan & lesson plan 3. Value added/ certificate course enrolment	Activities 2. Guest Lecture 3.Program on Gender equality and Women empowerment . 4.Display of attendance 5 .1st IA	2.Competition for students 3. 3.Display of attendance 4. 2nd IA 5. FDP	students 2.Make –up test 3. Display of attendance 4.Workshop 5. Display of consolidated marks	2.Curriculum feedback and analysis.
HINDI		1.BoS meeting 2.Display of teaching plan & lesson plan	1.Inaugrautionof Department Association Activities 2.Display of attendance 3.1st IA	1.Guest Lecture 2.Competition for students 3.Display of attendance 2. 2nd IA	1. Make-up test 2. Display of attendance 3. Display of consolidated marks	1.Submission of CIA marks 2.Curriculum feedback and analysis.

Department	**March**	**April**	**May**	**June**	**July**	**August**
Physics		1. Capabilty building program 2.Online National Seminar 3.Study visit 4. Organization of seminar	1. College level competitions 2. 1st IA 3.Guest lecture 4.Peer tutoring 5. FDP on curricular design 6. Outreach program	1. 2nd IA 2.Guest Lecture 3. Online National level seminar 4. Makeup test	1. Quiz competitions .	.
Maths	1.Submission of documents to IQAC	1.BOS Meeting 2.Poster presentation	1.Display of attendance 2.1st IA 3.Math exhibition	1.Display of attendance 2.BOE meeting 3.2nd IA	1.Guest lecture 2.Display of consolidated marks 3.Submission of CIA	1.Submission of documents to IQAC

			4.Faculty exchange programme	4.Makeup test	marks 4.Curriculum feedback &analysis 5.Natonal conference	
Chemistry	1.Submission of documents to IQAC 2. BOS meeting	1. Departmental competitions. 2.State level conference	1. Display of attendance 2. 1st IA 3.Programme for advanced learners Programme for slow learners	1.Display of attendance 2.BOE meeting 3. 2nd IA 4.Industry visit/field visit/survey 5.Makeup test Coaching for JAM/PGCET/other competitive examination	1.Extension activities 2. Practical IA 2.Display of consolidated marks 3.Submission of CIA marks 4.validctoryof chemical society 5.Workshop for students 6.curiiculum feedback & analysis	1. FDP 2.Submission of documents to IQAC
Zoology	1.Submission of CIA marks	1.World Health day 2.Natonal seminar 3.Faculty development program 4. BoS meeting	1.Display of attendance 2.1st IA	1.Dispaly of attendance 2.BoS meeting 3.World food safety day 4. 2nd IA 5. Makeup test	1.Diaplay of consoidated marks 2.Submission of CIA Marks. 3. Curriculum feedback & analysis	1.Submission of documents to IQAC
Botany	1.SEE	1.Project assignment	1. Association activity. 2.Mini project assignment	1.Guest Lecture	1. Article writing competition	1. Project exhibition 2.FDP 3.SEE
Electronics	Project /Mini project assignment	Industry visit for Final year students	Exhibition	Lab demonstration to junior students to senior students	1.) Guest lecture. 2.)Association activities	Seminar/conference /Workshop /FDP
Computer Science	1. Hands on training on Android apps Development					
BIOTECHNOLOGY/ MICROBIOLOGY	1.Workshop related to career guidance	1. Workshop on – Laboratory safety and waste management	1.World Biological Diversity DAy – 22 May 2023 –	1.27th June, Celebration of the Microbial		

			Photography competition	world - competition		
PLACEMENT	1.L & T campus drive 2.Federal Bank campus drive 3.E & Y	1.Soft skill training 2.TCS Campus BPS drive/Employable 3.Q Spider campus drive	1.Seminar on how to face UPSE 2.Shilpa medicare campus drive/Employable aptitude training 3.Guest Lecture/ employabelaptitude training 4.Workshop on grooming	1. HCL Campus drive/ Employable aptitude training 2.IBM Campus drive 3.Global Foundaries campus drive/ Employable aptitude training 4. BYJUS campus drive		
Library	Celebrating world book day.	Guest Lecture on NLIST	Book Exhibition on Environmental Day.	Workshop on DEINET & NLIST resources.	Celebration of Library week & Guest Lecture.	Seminar on Plagirasim
Kannada	Organising various competitions for students	Organising various guest lectures for students	Organizing field visits students	Conducting skill development programmes	Organising FDP programmes for faculties and students	
English	1.Submission of documents to IQAC 2.Extension activity	1. Program on Gender equality and Women empowerment . 2. BoS meeting 3.Celebration of English language Day	1.Display of attendance 2. 1st IA 3. Capacity development program 4. Guest lecture	1.Display of attendance 2. BoE meeting 3. 2nd IA 4. FDP Competition for students 5. Make up test	1.Extension Activities 2.Displayof consolidated marks 3.Submission of CIA Marks 4.Ciriculumfeedback & Analysis Seminar/Seminar competition	1. Workshop 2. Submission of documents to IQAC 3. Conference
Hindi	1.Submission of documents to IQAC	1.Value added/ certificate course enrolment 2. BoS meeting	1.Display of attendance 2. 1st IA 3. Guest lecture	1.Display of attendance 2. BoE meeting 3. 2nd IA 4. Competition for students 5.Make-up test	1.Diaplay of consoidated marks 2. submission of CIA marks 3. Curriculum feedback & analysis	1.Submission of documents to IQAC

B.Sc. SEMESTER-V

Modern Physics DSE-PHY-505A

Teaching Hours : 60 **CIA Marks : 30**

Examination Hours : 03 **SEE Marks : 70**

Scheme (L:T:P) 4:0:0 **Credits : 04**

Course objectives : This course (PH -511) will enable the students to

- Understand different lasers and their working.
- Understand the structure of an atom by various models.
- Understand the dependency of spectral lines of external electric and magnetic fields.

Course Outcome: After successful completion of the course, students are able to;

DSE-PHY-505A.1 – Outline the fundamentals of quantum mechanics and wave mechanics.

DSE-PHY-505A.2 – Interpret the atomic spectra and effect of magnetic field on light.

DSE-PHY-505A.3 – Discuss molecular spectra and LASER Raman effect.

DSE-PHY-505A.4 – Comparative study of nuclear models, decay and detectors.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-505A.1	3	3				3					3	3	3	3
DSE-PHY-505A.2	3	3				3					3	3	3	3
DSE-PHY-505A.3	3	3	2	3		3					3	3	3	3
DSE-PHY-505A.4	3	3	2			3					3	3	3	3

Course Content

Unit-1 : Fundamentals of Quantum Mechanics:

Brief discussion on failure of classical physics to explain black body radiation, Photoelectric effect, Compton effect, Expression for energy of the scattered photon, kinetic energy of the recoil electron and Compton shift (with derivation). stability of atoms and spectra of atoms. Uncertainty principle: Statement and illustration by Gamma ray microscope and diffraction of electrons at a single slit. **7 hr**

Unit II: Wave Mechanics:

Setting up of time independent Schrodinger's equation. Physical interpretation of wave function. Eigen function and Eigen values. Expression for energy: Particle in a one-dimensional infinite potential well (derivation), mention of expression in three dimensions, degeneracy and Particle in a finite potential well (qualitative). Concept of potential barrier and quantum mechanical tunnelling. Qualitative discussion on quantum treatment of Linear Harmonic Oscillator. **8 hr**

Unit III: Atomic Spectra:

Vector-Atom model. The Pauli exclusion principle. Electron configuration in an atom with some examples. Studies on LS and jj Coupling schemes in case of one valence electron and two valence electron atoms. Spectral terms and their arrangement following Hund's and n+l rules. Selection rules for transitions. Principal, Sharp, diffused and fundamental spectral series for Sodium (Na) element. **8 hr**

Unit IV: Magnetic field effect on light :

Magnetic moment due to orbital and spin motion. Stern- Gerlach Experiment. Larmor precession. Normal and Anomalous Zeeman effect. Expression for Zeeman shift (using quantum theory) Theory of anomalous Zeeman effect and expression for Lande 'g' factor. Energy level diagram for sodium D lines in a weak magnetic field. **7 hr**

Unit V: Molecular spectra:

Different types of motions (electronic, vibration and rotation) in a molecule. Molecular energy distribution in the electromagnetic spectrum. General features of band spectra compared to atomic spectra. The diatomic molecule as a rigid rotator: Energy, energy levels and spectra (with derivation). Diatomic molecule as a non-rigid rotator(qualitative). **8 hr**

Unit VI: Raman effect:

Rayleigh's Scattering and Raman Scattering. Quantum theory of Raman effect. Applications of Raman effect. **3 hr**

Lasers : Einstein's theory of spontaneous emission, stimulated emission and stimulated absorption. Conditions for laser action. Types of lasers: Theory, construction and working of Gas lasers (He-Ne) and Diode laser. Applications of Lasers. **4 hr**

Unit VII: Nuclear models:

Liquid-drop model: Semi-empirical mass formula and explanation of the terms, nuclear fission on the basis of liquid-drop model. Shell model(qualitative), Magic numbers.

Nuclear Reactions: Types of nuclear reactions with examples. Energy balance in nuclear reactions and the Q-value. Brief discussions on compound nucleus formation in nuclear reactions.

Alpha decay: Gammow's theory of Alpha decay (Without derivation). Derivation of expression for alpha disintegration energy. Range of Alpha particles. Experimental determination of range of alpha particles. Geiger-Nuttal relation and its significance(qualitative). Alpha particle spectra with examples.

Beta decay: Types of beta decay with examples. The neutrino Theory of Beta decay(qualitative). Decay scheme of Tl-204.

Gamma decay: Origin of Gamma rays. Decay schemes of Cs-137, Na-22, Mn-54 and Co-57 Mention different types of interaction of gamma radiation with matter. **10 hr**

Unit VIII: Detectors:

Variation of pulse height with applied voltage in gas filled detector. Brief explanation of ionization chamber and Proportional counter. Theoretical and experimental studies on Characteristics and dead time of Geiger-Muller counter. **5 hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

BLUE PRINT :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Fundamentals of Quantum Mechanics, Uncertainty principle	7	12	1T	--	1T	12
II	Wave Mechanics	8	15	--	1T	1T	15
III	Atomic Spectra	8	14	1T&1P	1T&1P	--	14
IV	Magnetic field effect on light:	7	12	1T/1P	--	1T	12
V	Molecular spectra	8	15	--	1P	1T	15
VI	Raman effect: Lasers:	7	12	1T/1P	1T,1T/1P	--	12
VII	Nuclear models:	10	17	1T	1T/1P	1T	17

VIII	Detectors:	5	07	1T	1T	--	07
TOTAL		**60**	**104**	**14**	**40**	**50**	**104**

QUESTION PAPER PATTERN:

Time : 3 Hrs **Max Marks : 70**

Instructions: 1. Answer all the sections.

2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5x2=10

II. Derive / Explain/Solve any SIX Out of EIGHT (3 Problems out of 8) 6x5 =30

III. Derive / Describe in detail any THREE out of FIVE. 3x10=30

Reference Books :

1. Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
2. Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning
3. Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
4. Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
5. Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, Cengage Learning
6. Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill
7. Moden Physics- Duggal and Chabra.
8. Modern physics- R. Murugeshan-- S.Chand Publication,New Dehli.
9. Introduction to modern physics- Ritchmeyer,Kennerd & Lauritser-TMH

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B.Sc. SEMESTER-V

Modern Physics Practical DSE-PHY-505A.P

Teaching Hours : 40 **CIA Marks : 15**

Examination Hours : 04 **SEE Marks : 35**

Scheme (L:T:P) 0:0:4 **Credits : 02**

Course objectives : This course (DSE-PHY-505A.P) will enable the students to

- Understand ionization of atoms.
- Understand the divergence of laser beam.
- Understand characteristics of photo cell
- Understand the uses of counters.

Course Outcome: After successful completion of the course, students develop the skill to;

DSE-PHY-505A.P.1 – Determine the Rydberg constant Boltzmann and Planck's constant.

DSE-PHY-505A.P.2 – Calculate the ionization potential of elements.

DSE-PHY-505A.P.3 – Use detectors to find the absorption co-efficient of matter.

DSE-PHY-505A.P.4 – Interpret the characteristics of photo cells.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-505A.P.1	1			3		2				2	3	3	3	3
DSE-PHY-505A.P.2	1			3		2				2	3	3	3	3
DSE-PHY-505A.P.3	1			3		2				2	3	3	3	3
DSE-PHY-505A.P.4	1			3		2				2	3	3	3	3

COURSE CONTENT

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine work function of material of filament of directly heated vacuum diode.
3. To determine value of Planck's constant using LEDs of at least 4 different colours.
4. To determine the ionization potential of mercury.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.
7. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photo sensor and compare with incoherent source sodium light.
8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
9. Study of hydrogen spectrum - determination of Rydberg constant
10. Ionization potential of Xenon/Mercury
11. Planck's constant using Photo cell /LED

12. Analysis of molecular spectra (Rotational spectra)
13. Study of Divergence of Laser Beam using Photo Diode
14. Characteristics of GM counter and GM tube (dead time).
15. Attenuation of Beta-radiation (absorption coefficient of aluminium)
16. Attenuation of Gamma rays in lead using GM tube and Cs-137 source.

BLUE PRINT :

Sl.No.	Particulars	Marks
1.	Relevant formula and nature of graph	03
2.	Circuit/block diagram	03
3.	Experiment skill and connection	04
4.	Tabular column	03
5.	Record of observations	06
6.	Graph and calculations	06
7.	Unit and accuracy	02
8.	Journal	04
9.	Oral	04
	TOTAL...	**35**

Reference Books :

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Mich Educational Publishers
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

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B.Sc. SEMESTER-V

Quantum Mechanics DSE-PHY-505B

Teaching Hours : 60 **CIA Marks : 30**

Examination Hours : 03 **SEE Marks : 70**

Scheme (L:T:P) 4:0:0 **Credits : 04**

Course objectives : This course (DSE-PHY-505B) will enable the students to

- Understand the failures of classical mechanics and rise of quantum mechanics.
- Understand the different operators and their applications.
- Understand the necessity of Schrodinger's wave equation.

Course Outcome : After successful completion of the course, students are able to;

DSE-PHY-505B.1 – Outline the fundamentals of quantum mechanics and wave mechanics.

DSE-PHY-505B.2 – Apply operators to Schrodinger wave equation for the study of one-dimensional systems.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-505B.1	3	3				2						3	3	3
DSE-PHY-505B.2	3	3				1						3	3	3

COURSE CONTENT

Unit-I: Fundamentals of Quantum Mechanics:

Brief discussion on failure of classical physics to explain black body radiation, Photoelectric effect, Compton effect, stability of atoms and spectra of atoms. **5 hr**

Unit-2: Matter Waves: de Broglie hypothesis.

Expression for group velocity and Phase velocity of matter waves. Davisson - Germer experiment with result and its significance. Problems. **5 hr**

Unit-3: Uncertainty principle:

Statement and illustration by Gamma ray microscope and diffraction of electrons at a single slit. Mention of Time-Energy Uncertainty relation and Angular Momentum- Angular position Uncertainty relation. Necessity of Quantum Mechanics, basics of Schrodinger Formulation and Heisenberg Formulation of Quantum mechanics. Problems. **10 hr**

Unit-4: Wave Mechanics :

Wave packet; Derivation of Group and phase velocity of wave packet. Setting up of one-dimensional time dependent Schrodinger equation for free particle and hence Schrodinger equation for particle in a force field drivable from potential. Mention of three-dimensional time dependent Schrodinger equation. Setting up of time independent Schrodinger's equation from time dependent equation. **12 hr**

Unit-5: Eigen values and Eigen function:

Physical interpretation of wave function, Normalization condition, Probability current density, Expectation value Eigen values and Eigen function. Problems. **5 hr**

Unit-6: Operators :

Position, momentum and Energy operators; Commutators of position and momentum operators; Expectation values of position and momentum. **6 hr**

Unit-7: Applications of time independent Schrodinger equation to one dimensional system :

Eigen values and Eigen functions of particle in one dimensisonal infinite square well potential (Derivation). Mention of Eigen values and Eigen functions of particle in three-dimensional infinite square well potential, Concept of degeneracy. Eigen values and Eigen functions of Particle in a one-dimensional finite square potential well (Qualitative). Particle passing through Step Potential: derivation of transmission and reflection coefficients. Problems **12 hr**

Unit-8: Harmonic Oscillator:

Qualitative discussion on quantum treatment of Linear Harmonic Oscillator (One dimensional), concept of zero-point energy. Comparison of Eigen values of particle in infinite potential well and Linear Harmonic Oscillator. **5hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

BLUE PRINT :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Fundamentals of Quantum Mechanics	5	09	1T,1T/1P	1T	--	09
II	Matter Waves	5	10	--	--	1T	10
III	Uncertainty principle	10	17	1T/1P	1P	1T	17
IV	Wave Mechanics	12	20	--	2T	1T	20
V	Eigen values and Eigen function	5	09	2T	1P	--	09
VI	Operators	6	10	--	--	1T	10
VII	Applications of time independent Schrodinger equation to one dimensional systems	12	20	--	1T&1P	1T	20
VIII	Harmonic Oscillator	5	09	1T&1P	1T	--	09
TOTAL		**60**	**104**	**14**	**40**	**50**	**104**

QUESTION PAPER PATTERN

Time : 3 Hrs **Max Marks : 70**

Instructions: 1. Answer all the sections.

2. Draw the neat labeled diagrams wherever necessary.

I.	Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7)	5x2=10
II.	Derive / Explain/Solve any SIX Out of EIGHT (3 Problems out of 8)	6x5 =30
III.	Derive / Describe in detail any THREE out of FIVE.	3x10=30

Reference Books:

1. A Text book of Quantum Mechanics, P.M. Mathews & K. Venkatesan, 2nd Ed., 2010, McGraw Hill
2. Quantum Mechanics, Robert Eisberg and Robert Resnick, 2ndEdn., 2002, Wiley.
3. Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning Quantum Mechanics for Scientists & Engineers, D.A.B. Miller, 2008, Cambridge University Press
4. The development of Quantum mechanics" 1933 Nobel Lecture by Werner Heisenberg.
5. The fundamental idea of wave mechanics" 1933 Nobel Lecture by Erwin Schrödinger
6. Quantum Mechanics vol 1 and vol 2(I ed)- Shrivatsav-Pragati Prakashan,
7. Quantum Mechanics- Gupta,Kumar & Sharma- Jayprakashnath &Co,
8. Quantum Mechanics (I ed)- Powell-Oxford& IBH Publishing, NewDehli,
9. Quantum Mechanics - Pauling& Wilson.
10. Foundation of Quantum Mechanics by A B Gupta;
11. A Text book of Quantum Mechanics, P.M. Mathews & K. Venkatesan,
12. Quantum Mechanics, Robert Eisberg and Robert Resnick, 2ndEdn., 2002, Wiley.
13. Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
14. Quantum Mechanics, G. Aruldhas, 2ndEdn. 2002, PHI Learning of India.
15. Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.
16. Quantum Mechanics for Scientists & Engineers, D.A.B. Miller, 2008, Cambridge University Press
17. Quantum Mechanics, Eugen Merzbacher, 2004, John Wiley and Sons, Inc.
18. Introduction to Quantum Mechanics, David J. Griffith, 2nd Ed. 2005
19. Quantum Mechanics, Walter Greiner, 4thEdn., 2001, Springer

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B.Sc. SEMESTER-V

Quantum Mechanics Practical DSE-PHY-505B.P

Teaching Hours : 40 **CIA Marks : 15**

Examination Hours : 04 **SEE Marks : 35**

Scheme (L:T:P) 0:0:4 **Credits : 02**

Course objectives : This course (DSE-PHY-505B.P) will enable the students to

- Understand the method to solve Schrodinger's equation for various situations.
- Understand quantum tunneling effect.

Course Outcome : After successful completion of the course, students develop the skill to;

DSE-PHY-505B.P.1 – Compute energy and potential of atom in ground and excited state using Schrodinger wave equation.

DSE-PHY-505B.P.2 – Apply Schrodinger wave equation to find the physical parameters in different cases.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-505B.P.1	1			3		2				2	3	3	3	3
DSE-PHY-505B.P.2	1			3		2				2	3	3	3	3

COURSE CONTENT

PRACTICAL-DSE LAB: QUANTUM MECHANICS

60 Lectures

Use C/C^{++}/Scilab for solving the following problems based on Quantum Mechanics like

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2}[V(r) - E] \text{ where } V(r) = -\frac{e^2}{r}$$

Here, m is the reduced mass of the electron. Obtain the energy eigenvalues and plot the corresponding wavefunctions. Remember that the ground state energy of the hydrogen atom is ≈ -13.6 eV. Take e = 3.795 $(eVÅ)^{1/2}$, ħc = 1973 (eVÅ) and m = $0.511 \times 10^6 eV/c^2$.

2. Solve the s-wave radial Schrodinger equation for an atom:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2}[V(r) - E]$$

Where m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential

$$V(r) = -\frac{e^2}{r}e^{-r/a}$$

Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wavefunction. Take e = 3.795 $(eVÅ)^{1/2}$, m = $0.511 \times 10^6 eV/c^2$, and a = 3 Å, 5 Å, 7 Å. In these units ħc = 1973 (eVÅ). The ground state energy is expected to be above -12 eV in all three cases.

3. Solve the s-wave radial Schrodinger equation for a particle of mass m:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2}[V(r) - E]$$

For the anharmonic oscillator potential

$$V(r) = \frac{1}{2}kr^2 + \frac{1}{3}br^3$$

for the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m = 940 MeV/c^2, k = 100 MeV fm^{-2}, b = 0, 10, 30 MeV fm^{-3} In these units, cħ = 197.3 MeV fm. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.

4. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2\mu}{\hbar^2}[V(r) - E]$$

where μ is the reduced mass of the two-atom system for the Morse potential

$$V(r) = D\left(e^{-2\alpha r'} - e^{-\alpha r'}\right), \qquad r' = \frac{r - r_o}{r}$$

Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function.
Take: m = $940 \times 10^6 eV/C^2$, D = 0.755501 eV, α = 1.44, r_o = 0.131349 Å

Laboratory based experiments:

1. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency
2. To study the quantum tunnelling effect with solid state device, e.g. tunnelling current in backward diode or tunnel diode.
3. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
4. To determine value of Planck's constant using LEDs of at least 4 different colours.
5. Assignments

BLUE PRINT :

Sl.No.	Particulars	Marks
1.	Relevant formula and nature of graph	03
2.	Circuit/block diagram	03
3.	Experiment skill and connection	04
4.	Tabular column	03
5.	Record of observations	06
6.	Graph and calculations	06
7.	Unit and accuracy	02
8.	Journal	04
9.	Oral	04
	TOTAL	**35**

Reference Books :

1. Schaum's Outline of Programming with C++. J.Hubbard, 2000 , McGraw-Hill Publications.
2. Numerical Recipes in C: The Art of Scientific Computing, W.H.Press et al., 3rdEdn., 2007, Cambridge University Press.
3. Elementary Numerical Analysis, K.E.Atkinson, 3 rd Ed n., 2007, Wiley India Edition.
4. A Guide to MATLAB, B.R. Hunt, R.L. Lipsman, J.M. Rosenberg, 2014, 3rd Edn., Cambridge University Press
5. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A. Vande Wouwer, P. Saucez, C. V. Fernández.2014 Springer ISBN: 978-3319067896
6. Scilab by example: M. Affouf2012ISBN: 978-1479203444
7. Scilab (A Free Software to Matlab): H. Ramchandran, A.S. Nair. 2011 S. Chand and Company, New Delhi ISBN: 978-8121939706
8. Scilab Image Processing: Lambert M. Surhone. 2010Betascript Publishing ISBN: 978- 6133459274A
9. Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
10. Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.

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B.Sc. SEMESTER-V

Renewable Energy and Energy Harvesting SEC-PHY-505A

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0

Course objectives : This course (SEC-PHY-505A) will enable the students to

- Understand sources of energy.
- Understand PV systems.
- Understand the methods of harvesting the energy.

Course Outcome : After successful completion of the course, students are able to;

SEC-PHY-505A.1 – Explain different types of renewable and non-renewable energy sources.

SEC-PHY-505A.2 – Employ the concept of solar energy for different applications.

SEC-PHY-505A.3 – Recognize different types of energy harvesting.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY -505A.1	3	3		3				3			3	3	3	3
SEC-PHY -505A.2	3	3		3				3			3	3	3	3
SEC-PHY -505A.3	3	3		3				3			3	3	3	3

COURSE CONTENT

Unit-1: Fossil fuels and Alternate Sources of energy:

Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity. **4 hr**

Unit-2: Solar energy:

Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy. Solar water heater, solar green houses, solar cell (quantitative). Characteristics of photovoltaic (PV) systems, PV models and equivalent circuits and sun tracking systems (qualitative). **6 hr**

Unit-3: Energy harvesting - I:

Wind Energy harvesting Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass. **8 hr**

Unit-4: Energy harvesting - II

Geothermal Energy: Geothermal Resources, Geothermal Technologies.

Hydropower Energy: Hydropower resources, technologies and environmental impact.

Piezoelectric Energy: Introduction piezoelectric effect, characteristics of piezoelectric materials and mathematical description of piezoelectricity, piezoelectric parameters and modeling piezoelectric generators, piezoelectric energy harvesting applications.

Electromagnetic Energy: Linear generators, physics mathematical models, recent applications\ Renewable sources of energy, sustainability and environmental issues. **12 hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

BLUE PRINT :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Fossil fuels and Alternate Sources of energy	04	09	2T	1T	--	09
II	Solar energy	06	14	2T	--	1T	14
III	Energy harvesting - I	08	14	2T	2T	--	14
IV	Energy harvesting - II	12	22	1T	2T	1T	22
TOTAL		**30**	**59**	**14**	**25**	**20**	**59**

QUESTION PAPER PATTERN

Time : 1.5 Hrs **Max Marks : 35**

Instructions: 1. Answer all the sections.

2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN. (5 X 2 = 10)

II. Derive / Explain/Solve any THREE Out of FIVE. (3 X 5 = 15)

III. Derive / Describe in detail any ONE out of TWO. (1 X10 =10)

Reference Books:

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New,Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company,Ltd.
4. Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004, Oxford University Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich,(USA).

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B.Sc. SEMESTER-V

Renewable energy and energy harvesting Practical

SEC-PHY-505A.P

Teaching Hours : 02 **CIA Marks : 15**

Examination Hours : 04 **SEE Marks : 35**

Scheme (L:T:P) 0:0:2 **Credits : 01**

Course objectives : This course (SEC-PHY-505A.P) will enable the students to

- Understand sources of energy.
- Understand PV systems.
- Understand the methods of harvesting the energy.

Course Outcome : After successful completion of the course, students develop the skill to;

SEC-PHY-505A.P.1 – Demonstrate models of different renewable energy.

SEC-PHY-505A.P.2 – Convert one form of energy into other form of energy.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY -505A.P.1	1			3		2				2	3	3	3	3
SEC-PHY -505A.P.2	1			3		2				2	3	3	3	3

COURSE CONTENT

1. Demonstration of Training modules on Solar energy, wind energy, etc.
2. Conversion of vibration to voltage using piezoelectric materials
3. Conversion of thermal energy into voltage using thermoelectric modules.

BLUE PRINT :

Sl.No.	Particulars	Marks
1.	Relevant formula and nature of graph	03
2.	Circuit/block diagram	03
3.	Experiment skill and connection	04
4.	Tabular column	03
5.	Record of observations	06
6.	Graph and calculations	06
7.	Unit and accuracy	02
8.	Journal	04
9.	Oral	04
	TOTAL	**35**

Reference Books :

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New,Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company,Ltd.
4. Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004, Oxford University Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich,(USA).

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B.Sc. SEMESTER-V

Weather forecasting SEC-PHY-505B

Teaching Hours : 30 **CIA Marks : 15**

Examination Hours : 1.5 **SEE Marks : 35**

Scheme (L:T:P) 2:0:0 **Credits : 02**

Course objectives: This course (SEC-PHY-505B) will enable the students to

- Understand different layers of the atmosphere.
- Understand different types of climates.

Course Outcome: After successful completion of the course, students are able to;

SEC-PHY-505B.1 – Explain the physical structure and composition of atmosphere.

SEC-PHY-505B.2 – Measure different parameters of weather.

SEC-PHY-505B.3 – Illustrate classification and causes of climate changes.

SEC-PHY-505B.4 – Outline the types and methods of weather forecasting.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY-505B.1	3	3		3		3		2			3	3	3	3
SEC-PHY-505B.2	3	3		3		3		2			3	3	3	3
SEC-PHY-505B.3	3	3		3		3		2			3	3	3	3
SEC-PHY-505B.4	3	3		3		3		2			3	3	3	3

COURSE CONTENT

Unit-1: Introduction to atmosphere:

Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics. **9 hr**

Unit-2: Measuring the weather:

Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws. **4 hr**

Unit-3: Weather systems:

Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes. **3 hr**

Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.

6 hr

Unit-4: Basics of weather forecasting:

Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts. **8 hr**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

BLUE PRINT :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Introduction to atmosphere	09	19	2T	1T	1T	19
II	Measuring the weather	04	07	1T	1T	--	07
III	Weather systems, Climate & Climate Change	09	19	2T	1T	1T	19
IV	Basics of weather forecasting	08	14	2T	2T	--	14
TOTAL		**30**	**59**	**14**	**25**	**20**	**59**

QUESTION PAPER PATTERN

Time : 1.5 Hrs **Max Marks : 35**

Instructions: 1. Answer all the sections.

2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN. (5 X 2 = 10)

II. Derive / Explain/Solve any THREE Out of FIVE. (3 X 5 = 15)

III. Derive / Describe in detail any ONE out of TWO. (1 X10 =10)

Reference Books:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
5. Why the weather, Charls Franklin Brooks, 1924, Chpraman & Hall, London.
6. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

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B.Sc. SEMESTER-V

Weather forecasting Practical

SEC-PHY-505B.P

Teaching Hours : 02 **CIA Marks : 15**

Examination Hours : 04 **SEE Marks : 35**

Scheme (L:T:P) 0:0:2 **Credits : 01**

Course objectives : This course (SEC-PHY-505B.P) will enable the students to

- Understand the ways in which different parameters of weather can be calculated.

Course Outcome : After successful completion of the course, students develop the skill to;

SEC-PHY-505B.P.1 – Compute different parameters of weather

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY-505B.P.1	1			3		2				2	3	3	3	3

COURSE CONTENT

1. Study of synoptic charts & weather reports, working principle of weather station.
2. Processing and analysis of weather data:
3. To calculate the sunniest time of the year.
4. To study the variation of rainfall amount and intensity by wind direction.
5. To observe the sunniest/driest day of the week.
6. To examine the maximum and minimum temperature throughout the year.
7. To evaluate the relative humidity of the day.
8. To examine the rainfall amount month wise.
9. Exercises in chart reading: Plotting of constant pressure charts, surfaces charts, upper wind charts and its analysis.
10. Formats and elements in different types of weather forecasts/ warning (both aviation and non-aviation)

BLUE PRINT :

Sl.No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column	03
5	Record of observations	06
6	Graph and calculations	06
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL..	**35**

Reference Books :

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
5. Why the weather, Charls Franklin Brooks, 1924, Chpraman & Hall, London.
6. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

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DEPARTMENT OF PHYSICS

Semester-VI

Digital & Analog circuits and Instrumentation DSE-PHY-606A

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives : This course (DSE-PHY-606A) will enable the students to

- Understand Basic gates.
- Understand the working of transistors.
- Understand the working of different oscillators and multivibrators..

Course Outcome: After successful completion of the course, students are able to;

DSE-PHY-606A.1 – Use Boolean algebra to study logical circuits.
DSE-PHY-606A.2 – Employ the concept of semiconductors to study different devices.
DSE-PHY-606A.3 – Describe the working of oscillator, multivibrators and applications of Operational Amplifiers.
DSE-PHY-606A.4 - Outline the construction of CRO and its applications.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-606A.1	3	3	2	3		2					3	3	3	3
DSE-PHY-606A.2	3	3		3		2					3	3	3	3
DSE-PHY-606A.3	3	3		3		3					3	3	3	3
DSE-PHY-606A.4	3	3		3		3					3	3	3	3

Course Content :

Unit-1: Logic Gates : Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. **4 hr**

Unit-2: Boolean Algebra : De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method). Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. **9 hr**

Unit-3: Semiconductor Diodes : P and N type Semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. **5 hr**

Unit-4: Bipolar Junction transistors : n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC

Configurations. Current gains a and ß. Relations between a and ß. Load Line analysis of Transistors. DC Load line and Q-point. Active, Cutoff, and Saturation Regions. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers. **12 hr**

Unit-5: Operational Amplifiers (Black Box approach) : Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector. **13 hr**

Unit-6: Sinusoidal Oscillators : Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator **5 hr**

Unit-7: CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. **3 hr**

Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation **5 hr**

Unit-8: Timer IC: IC 555 Pin diagram and its application as Astable & Mono stable Multi vibrator **4 hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Logic Gates	4	7	1T	1T	--	7
II	Boolean Algebra	9	14	1T&1P	--	1T	14
III	Semiconductor Diodes	5	9	2T	1P	--	9
IV	Bipolar Junction transistors	12	20	--	2T	1T	20
V	Operational Amplifiers (Black Box approach)	13	22	1T	1T&1P	1T	22
VI	Sinusoidal Oscillators	05	10	--	--	1T	10
VII	CRO: Power Supply:	08	15		1P	1T	15
VIII	Timer IC	04	7	1T	1T	--	7
	TOTAL	**60**	**104**	**14**	**40**	**50**	**104**

Question paper pattern:

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10
II. Derive / Explain/Solve any SIX Out of EIGHT (3 Problems out of 8) 6 X 5 = 30
III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

Reference Books :

1. Integrated Electronics, J. Millman and C. C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill. Microelectronic Circuits, M.H. Rashid, 2nd Edn.,2011, Cengage Learning.
3. Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning
4. Digital Principles & Applications, A. P. Malvino, D. P. Leach & Saha, 7th Ed., 2011, Tata McGraw Hill
5. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
6. OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

DEPARTMENT OF PHYSICS

Semester-VI

Digital & Analog circuits and Instrumentation Practical DSE-PHY-606A.P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits :2**

Course objectives: This course (DSE-PHY-606A.P) will enable the students to

- Understand Basic gates
- Understand the working of transistors.

Course Outcome : After successful completion of the course, students are able to;

DSE-PHY-606A.P.1 – Use basic gates for different operations.
DSE-PHY-606A.P.2 – Interpret the characteristics of transistor and transistor as an amplifier.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-606A.P.1	1			3		2				2	3	3	3	3
DSE-PHY-606A.P.2	1			3		2				2	3	3	3	3

Course Content

Unit-1: Logic Gates : Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. **4 hr**

Unit-2: Boolean Algebra : De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method). Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. **9 hr**

Unit-3: Semiconductor Diodes : P and N type Semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. **5 hr**

Unit-4: Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains a and ß. Relations between a and ß. Load Line analysis of Transistors. DC Load line and Q-point. Active, Cutoff, and Saturation Regions. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers. **12 hr**

Unit-5: Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1)

Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector. **13 hr**

Unit-6: Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator **5 hr**

Unit-7: CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. 3 hr

Power Supply : Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation **5 hr**

Unit-8: Timer IC: IC 555 Pin diagram and its application as Astable & Mono stable Multi vibrator **4 hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Logic Gates	4	7	1T	1T	—	7
II	Boolean Algebra	9	14	1T&1P	—	1T	14
III	Semiconductor Diodes	5	9	2T	1P	—	9
IV	Bipolar Junction transistors	12	20	—	2T	1T	20
V	Operational Amplifiers (Black Box approach)	13	22	1T	1T&1P	1T	22
VI	Sinusoidal Oscillators	05	10	—	—	1T	10
VII	CRO:Power Supply:	08	15		1P	1T	15
VIII	Timer IC	04	7	1T	1T	—	7
	TOTAL	**60**	**104**	**14**	**40**	**50**	**104**

Question paper pattern:

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10
II. Derive / Explain/Solve any SIX Out of EIGHT (3 Problems out of 8) 6 X 5 = 30
III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

Reference Books :

1. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronic devices and circuits, S. Salivahanan and N.Suresh Kumar, 2012, Tata Mc-Graw Hill. Microelectronic Circuits, M. H. Rashid, 2ndEdn., 2011, Cengage Learning.
3. Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning
4. Digital Principles & Applications, A. P. Malvino, D. P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill
5. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
6. OP-AMP and Linear Digital Circuits, R. A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

DEPARTMENT OF PHYSICS

Semester-VI

Digital & Analog circuits and Instrumentation Practical DSE-PHY-606A.P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 2**

Course objectives: This course (DSE-PHY-606A.P) will enable the students to

- Understand Basic gates
- Understand the working of transistors.

Course Outcome : After successful completion of the course, students are able to;

DSE-PHY-606A.P.1 – Use basic gates for different operations.
DSE-PHY-606A.P.2 – Interpret the characteristics of transistor and transistor as an amplifier.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-606A.P.1	1			3		2				2	3	3	3	3
DSE-PHY-606A.P.2	1			3		2				2	3	3	3	3

Course Content

1. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO
2. To verify and design AND, OR, NOT and XOR gates using NAND gates.
3. To minimize a given logic circuit.
4. Half adder, Full adder and 4-bit Binary Adder.
5. Adder-Subtractor using Full Adder I.C.
6. To design an astable multivibrator of given specifications using 555 Timer.
7. To design a monostable multivibrator of given specifications using 555 Timer.
8. To study IV characteristics of PN diode, Zener and Light emitting diode
9. To study the characteristics of a Transistor in CE configuration.
10. To design a CE amplifier of a given gain (mid-gain) using voltage divider bias.
11. To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
12. To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response.
13. To study a precision Differential Amplifier of given I/O specification using Op- amp.
14. To investigate the use of an op-amp as a Differentiator
15. To design a Wien Bridge Oscillator using an op-amp.

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column	03
5	Record of observations	06
6	Graph and calculations	06
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**35**

Reference Books :

1. Basic Electronics: A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1994, Mc-Graw Hill.
2. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
3. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
4. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.

DEPARTMENT OF PHYSICS

Semester-VI

Solid State Physics DSE-PHY-606B

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives: This course (DSE-PHY-606B) will enable the students to

- Understand different properties of solids.
- Understand the concept of superconductivity.

Course Outcome: After successful completion of the course, students are able to;

DSE-PHY-606B.1 – Illustrate crystal structure and lattice dynamics.
DSE-PHY-606B.2 – Explain the domain theory by studying different magnetic materials.
DSE-PHY-606B.3 – Describe types of solids and their dielectric properties.
DSE-PHY-606A.4 - Outline the superconducting properties of materials.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-606B.1	3	3				2					3	3	3	3
DSE-PHY-606B.2	3	3				2					3	3	3	3
DSE-PHY-606B.3	3	3				2					3	3	3	3
DSE-PHY-606B.4	3	3				2		1			3	3	3	3

Course Content

Unit-1: Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Problems **6 hr**

Unit-2: Lattice: Types of Lattices. Reciprocal Lattice. Brillouin Zones, Bragg's Law, X-rays Diffraction by powder method, Atomic and Geometrical Factor. Problems **6 hr**

Unit-3: Lattice Dynamics: Linear Monoatomic and Diatomic Chains, Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T3 law **10 hr**

Unit-4: Magnetic properties of Materials: Diamagnetic, Paramagnetic, Ferrimagnetic, Anti-ferri and Ferromagnetic Materials, Classical Langevin Theory of diamagnetic and Paramagnetic materials. Quantum Mechanical Treatment of Paramagnetism **8 hr**

Unit-5: Domain Theory: Ferromagnetic Domains, Curie's law, Weiss's theory of Ferro magnetism. Discussion of Hysteresis loop, soft and hard magnetic materials. **4 hr**

Unit-6: Dielectric Properties of Materials: Polarization and its types. Local Electric Field at an Atom.

Depolarization Field. Electric Susceptibility. Polarizability. Clausius- Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant and its loss. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons. **10 hr**

Unit-7: Elementary band theory: Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient. Kronig Penny model. **10 hr**

Unit-8: Superconductivity: Experimental Results. Critical Temperature, magnetic field and current density, Meissner's effect, Type I and Type II Superconductors, High Tc Superconductors London's Equation and Penetration Depth. Isotopic effect. **6 hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Crystal Structure	06	12	1T	1T&1P	--	12
II	Lattice	06	10	--	--	1T	10
III	Lattice Dynamics	10	17	1T	1T/1P	1T	17
IV	Magnetic properties of Materials	08	14	2T	--	1T	14
V	Domain Theory	04	07	1T	1T	--	07
VI	Dielectric Properties of Materials	10	17	1T	1P	1T	17
VII	Elementary band theory	10	17	1T	1T/1P	1T	17
VIII	Superconductivity	06	10	--	2T	--	10
	TOTAL	**60**	**104**	**14**	**40**	**50**	**104**

Question paper pattern:

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10

II. Derive / Explain/Solve any SIX Out of EIGHT (3 Problems out of 8) 6 X 5 = 30

III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

Reference Books :

1. Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
2. Elements of Solid-State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
4. Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
5. Solid State Physics, Rita John, 2014, McGraw Hill
6. Solid-state Physics, H. Ibach and H Luth, 2009, Springer
7. Elementary Solid-State Physics, 1/e M. Ali Omar, 1999, Pearson India
8. Solid State Physics, M.A. Wahab, 2011, Narosa Publications
9. Solid state physics, A.J. Dekker
10. Solid state physics, S.O. Pillai

DEPARTMENT OF PHYSICS

Semester-VI

Solid State Physics Practical DSE-PHY-606B.P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 2**

Course objectives: This course (DSE-PHY-606B.P) will enable the students to

- Understand different properties of solids.
- Understand the Hall effect in semiconductors.

Course Outcome: After successful completion of the course, students develop the skill to;

DSE-PHY-606B.P.1 – Measure magnetic susceptibility of different materials.
DSE-PHY-606B.P.2 – Compute dielectric constant by various methods.
DSE-PHY-606B.P.3 – Analyze hysteresis curve.
DSE-PHY-606A.P.4 – Measure resistivity and Hall co-efficient for semiconductors.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
DSE-PHY-606B.P.1	1			3		2				2	3	3	3	3
DSE-PHY-606B.P.2	1			3		2				2	3	3	3	3
DSE-PHY-606B.P.3	1			3		2				2	3	3	3	3
DSE-PHY-606B.P.4	1			3		2				2	3	3	3	3

Course Content

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR)
6. To determine the refractive index of a dielectric layer using SPR
7. To study the PE Hysteresis loop of a Ferroelectric Crystal.
8. To draw the BH curve of iron using a Solenoid and determine the energy loss due to Hysteresis.
9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four- probe method (from room temperature to 150 oC) and to determine its band gap.
10. To determine the Hall coefficient of a semiconductor sample.

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column	03
5	Record of observations	06
6	Graph and calculations	06
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**35**

Reference Books :

1. Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
2. Elements of Solid-State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
4. Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
5. Solid State Physics, Rita John, 2014, McGraw Hill
6. Solid-state Physics, H. Ibach and H Luth, 2009, Springer
7. Elementary Solid-State Physics, 1/e M. Ali Omar, 1999, Pearson India
8. Solid State Physics, M.A. Wahab, 2011, Narosa Publications
9. Solid state physics, A.J. Dekker
10. Solid state physics, S.O. Pillai

DEPARTMENT OF PHYSICS

Semester-VI

Applied Optics SEC-PHY-606A

Teaching Hours : 30 **CIA Marks :15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 2**

Course objectives: This course (SEC-PHY-606A) will enable the students to

- Understand different types of emissions.
- Understand the concepts of holography.

Course Outcome: After successful completion of the course, students are able to;

SEC-PHY-606A.1 – Apply LASER action to study different types of LASERs.
SEC-PHY-606A.2 – Use Fourier transformation to study thin lens.
SEC-PHY-606A.3 – Explain the theory and applications of holography.
SEC-PHY-606A.4 – Illustrate the working of optical fibers.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY-606A.1	3	3		3		3		2			3	3	3	3
SEC-PHY-606A.2	3	3		3		3		2			3	3	3	3
SEC-PHY-606A.3	3	3		3		3		2			3	3	3	3
SEC-PHY-606A.4	3	3		3		3		2			3	3	3	3

Course Content

Unit-1: Sources and Detectors: Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers. **9 hr**

Unit-2: Fourier Optics: Concept of Spatial frequency filtering, Fourier transforming property of a thin lens **6 hr**

Unit-3: Holography: Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition **6 hr**

Unit-4: Photonics: Optical fibres and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating. **9 hr**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Sources and Detectors	09	19	2T	1P	1T	19
II	Fourier Optics	06	12	1T	2T	--	12
III	Holography	06	09	2T	1T	--	09
IV	Photonics	09	19	2T	1P	1T	19
	TOTAL	**30**	**59**	**14**	**25**	**20**	**59**

Question paper pattern:

Time: 1.5 Hour **Max Marks: 35**

Instructions: 1. Answer all the sections.
2. Draw the neat labelled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (5 X 2 = 10)
II. Derive / Explain/Solve any THREE Out of FIVE (3 X 5 = 15)
III. Derive / Describe in detail any ONE out of TWO (1 X10 =10)

Reference Books :

1. Fundamental of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw hill.
2. LASERS: Fundamentals & applications, K.Thyagrajan & A.K.Ghatak, 2010, Tata McGraw Hill
3. Fibre optics through experiments,M.R.Shenoy, S. K. Khijwania, et. al. 2009, Viva Books
4. Nonlinear Optics, Robert W. Boyd, (Chapter-I), 2008, Elsevier.
5. Optics, Karl Dieter Moller, Learning by computing with model examples, 2007, Springer.
6. Optical Systems and Processes, Joseph Shamir, 2009, PHI Learning Pvt. Ltd.
7. Optoelectronic Devices and Systems, S. C. Gupta, 2005, PHI Learning Pvt. Ltd.
8. Optical Physics, A. Lipson, S. G. Lipson, H. Lipson, 4th Edn., 1996, Cambridge Univ. Press

DEPARTMENT OF PHYSICS

Semester-VI

Applied Optics Practical SEC-PHY-606A.P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits :1**

Course objectives: This course (SEC-PHY-606A.P) will enable the students to

- Understand different types of emissions.
- Understand the concepts of holography.
- Understand image processing.

Course Outcome: After successful completion of the course, students are able to;

SEC-PHY-606A.P.1 – Use LASERs to find different parameters.
SEC-PHY-606A.P.2 – Analyze the characteristics of semiconductor sources.
SEC-PHY-606A.P.3 – Use Fourier optics and image processing.
SEC-PHY-606A.P.4 – Illustrate holography and interferometry.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY-606A.P.1	1			3		2				2	3	3	3	3
SEC-PHY-606A.P.2	1			3		2				2	3	3	3	3
SEC-PHY-606A.P.3	1			3		2				2	3	3	3	3
SEC-PHY-606A.P.4	1			3		2				2	3	3	3	3

Course Content

Experiments on Lasers:

a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid-state laser.
b. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid-state laser.
c. To find the polarization angle of laser light using polarizer and analyzer
d. Thermal expansion of quartz using laser

Experiments on Semiconductor Sources and Detectors:

a. V-I characteristics of LED
b. Study the characteristics of solid-state laser
c. Study the characteristics of LDR
d. Photovoltaic Cell
e. Characteristics of IR sensor

Experiments on Fourier Optics: Fourier optic and image processing

a. Optical image addition/subtraction
b. Optical image differentiation
c. Fourier optical filtering
d. Construction of an optical 4f system

Demonstration Experiments:

1. To study the interference pattern from a Michelson interferometer as a function of mirror separation in the interferometer.
2. The resulting interferogram is the Fourier transform of the power spectrum of the source.
3. Analysis of experimental interferograms allows one to determine the transmission characteristics of several interference filters. Computer simulation can also be done.
4. Experiments on Holography and interferometry:
5. Recording and reconstructing holograms
6. Constructing a Michelson interferometer or a Fabry Perot interferometer
7. Measuring the refractive index of air
8. Constructing a Sagnac interferometer
9. Constructing a Mach-Zehnder interferometer
10. White light Hologram
11. Experiments on Photonics: Fibre Optics
12. To measure the numerical aperture of an optical fibre
13. To study the variation of the bending loss in a multimode fibre
14. To determine the mode field diameter (MFD) of fundamental mode in a single-mode fibre by measurements of its far field Gaussian pattern
15. To measure the near field intensity profile of a fibre and study its refractive index profile
16. To determine the power loss at a splice between two multimode fibre

Blue print :

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column	03
5	Record of observations	06
6	Graph and calculations	06
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	**35**

Reference Books :

1. Fundamental of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw hill.
2. LASERS: Fundamentals & applications, K.Thyagrajan & A. K. Ghatak, 2010, Tata McGraw Hill
3. Fibre optics through experiments, M. R. Shenoy, S. K. Khijwania, et. al. 2009, Viva Books
4. Nonlinear Optics, Robert W. Boyd, (Chapter-I), 2008, Elsevier.
5. Optics, Karl Dieter Moller, Learning by computing with model examples, 2007, Springer.
6. Optical Systems and Processes, Joseph Shamir, 2009, PHI Learning Pvt. Ltd.
7. Optoelectronic Devices and Systems, S. C. Gupta, 2005, PHI Learning Pvt. Ltd.
8. Optical Physics, A.Lipson, S. G. Lipson, H.Lipson, 4th Edn., 1996, Cambridge Univ. Press

DEPARTMENT OF PHYSICS

Semester-VI

Nanomaterials for energy applications SEC-PHY-606B

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 2**

Course objectives: This course (SEC-PHY-606B) will enable the students to

- Understand the types of nanostructures.
- Understand thin film solar cells.

Course Outcome: After successful completion of the course, students are able to;

SEC-PHY-606B.1 – Differentiate between 1-D, 2-D and 3-D nanostructures by knowing the fundamentals of nanoscience.
SEC-PHY-606B.2 – Explain the synthesis of nanomaterials by different methods.
SEC-PHY-606B.3 – Explain material aspects of different cells.
SEC-PHY-606B.4 – Illustrate the fundamentals of fuel cells and nano sensors.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY-606B.1	3	3		3		3		2			3	3	3	3
SEC-PHY-606B.2	3	3		3		3		2			3	3	3	3
SEC-PHY-606B.3	3	3		3		3		2			3	3	3	3
SEC-PHY-606B.4	3	3		3		3		2			3	3	3	3

Course Content

Unit1: Background of nanoscience: Definition of Nano, Nano structures, Types of nanostructure and properties of nanomaterials: One dimensional, Two dimensional and three-dimensional nanostructured materials, Quantum Dots. Emergence and challenges of nanoscience and nanotechnology. **5 hr**

Unit 2: Synthesis and characterization of Nanomaterials: Synthesis of nano materials by top down and bottom-up approaches(qualitatively). Characterisations: -Diffraction analyses: X-ray diffraction technique for structural analysis, X-ray photoelectron spectroscopy (XPS), Scanning Electron Microscope (SEM), Transmission Electron Microscopy (TEM). Spectroscopic techniques: Infrared spectroscopy (IR) – Rotational & Vibrational - UV-visible - Raman Spectroscopy. (qualitative) **10 hr**

Unit-3: Nanomaterials for energy applications: Renewable Energy: Introduction to Semiconductor physics, Conducting and semiconducting materials, Semiconductor nanostructures, material aspect of solar cells, Thin film

solar cells, Solar cell characteristics and characterization techniques. Organic-inorganic hybrid solar cells, Current status and future prospects. **5 hr**

Unit-4: Fuel Cells & Nano sensors:

Fuel Cells: Polymer membranes for fuel cells, Acid/ alkaline fuel cells, design of fuel cells, Carbon Nanotubes for energy storage, Hydrogen Storage in Carbon Nanotubes, Use of nanoscale catalysts to save energy and increase the industrial productivity **5 hr**

Nano sensors: Introduction to sensors. Characteristics and terminology - static and dynamic characteristics. Micro and nano-sensors, Fundamentals of sensors, biosensor, micro fluids, Packaging and characterization of sensors, Sensors for aerospace and defense. Organic and inorganic nanosensors **5 hr**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	2 Marks	5 Marks	10 Marks	Total Marks
I	Background of nanoscience	05	09	2T	1P	--	09
II	Synthesis and characterization of Nanomaterials	10	22	1T	2T	1T	22
III	Nanomaterials for energy applications	05	09	2T	1T	--	09
IV	Fuel Cells & Nano sensors	10	19	2T	1P	1T	19
	TOTAL	**30**	**59**	**14**	**25**	**20**	**59**

Question paper pattern:

Time: 1.5 Hour **Max Marks: 35**

Instructions: 1. Answer all the sections.
2. Draw the neat labelled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (5 X 2 = 10)
II. Derive / Explain/Solve any THREE Out of FIVE (3 X 5 = 15)
III. Derive / Describe in detail any ONE out of TWO (1 X10 =10)

Reference Books :

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.
2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
3. Instrument E L Principe, P Gnauck and P Hoffrogge, Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.
4. Solar cells: Operating principles, technology and system applications by Martin A Green,Prentice Hall Inc, Englewood Cliffs, NJ, USA, 1981.
5. Semiconductor for solar cells, H J Moller, Artech House Inc, MA, USA, 1993.
6. Solis state electronic device, Ben G Streetman, Prentice Hall of India Pvt Ltd., New Delhi 1995.
7. Organic Photovoltaics – Materials, Device Physics and Manufacturing Technologies, (eds. C. Brabec, V. Dyakonov, U. Scherf), 2nd Ed., Wiley-VCH, Germany, 2014.
8. Hand book of Batteries and fuel cells, Linden, McGraw Hill, 1984.

DEPARTMENT OF PHYSICS

Semester-VI

Nanomaterials for energy applications Practical SEC-PHY-606B.P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 1**

Course objectives: This course (SEC-PHY-606B.P) will enable the students to

- Understand the types of nanostructures.
- Understand thin film solar cells.

Course Outcome: After successful completion of the course, students develop the skill to;

SEC-PHY-606B.P.1 – Interpret the properties of prepared nano materials.

Mapping of CO with PO and PSO:

CO	PO										PSO-1 (PCM)	PSO-1 (PME)	PSO-1 (PMCs)	PSO-1 (PMS)
	1	2	3	4	5	6	7	8	9	10				
SEC-PHY-606B.P.1	1			3		2				2	3	3	3	3

Course Content

Project Work

A Student (group of five) shall carry out research work on nano-materials under the supervision of faculty. The work may be carried out either in the college or in any recognized research institute/university, with the approval from the head of the department. Duration of the project work shall be Ten weeks. The findings of the project work should be submitted in the form of a report for evaluation by a Board of Examiners followed by a presentation. The project report should be containing Introduction, literature, experiment(synthesis), characterization, result and discussion part.

Blue print:

Assessment Methods

Assessment will be made through Viva-voce by the external and Internal Examiners. Short questions on the theoretical principles, experimental methodologies and instrumentations etc. of the different experiments included in the entire project work may be asked.

Reference Books:

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.
2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
3. Instrument E L Principe, P Gnauck and P Hoffrogge, Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.

4. Solar cells: Operating principles, technology and system applications by Martin A Green, Prentice Hall Inc, Englewood Cliffs, NJ, USA, 1981.
5. Semiconductor for solar cells, H J Moller, Artech House Inc, MA, USA, 1993.
6. Solid state electronic device, Ben G Streetman, Prentice Hall of India Pvt Ltd., New Delhi 1995.
7. Organic Photovoltaics – Materials, Device Physics and Manufacturing Technologies, (eds. C. Brabec, V. Dyakonov, U. Scherf), 2nd Ed., Wiley-VCH, Germany, 2014.
8. Hand book of Batteries and fuel cells, Linden, McGraw Hill, 1984.

DEPARTMENT OF CHEMISTRY (U. G.)

SYLLABUS Semester- V-1 Theory (CBCS)

Analytical Methods In Chemistry DSE-CHEM-505A

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credit : 4**

Course objectives : This course (DSE-CHEM-505A) will enable the students to

1. Explain importance of analytical chemistry
2. Describe mechanism of Extraction: Extraction by solvation and chelation
3. Decscribe principle, classification and efficiency of the chromatography technique.
4. Understand principles of UV-Visible spectrometry

Course Outcomes : After successfully completion of the course, student are able to;

DSC-CHEM-505A.1. Explain the concept of electromagnetic spectrum and interpret the spectra of simple molecules.
DSC-CHEM-505A.2. Recognize the behaviour of molecules with respect to temperature.
DSC-CHEM-505A.3. Apply statistical approach to study chemical analysis
DSC-CHEM-505A.4. Demonstrate the separation of organic compounds using chromatographic methods of analysis: IC, GLC, GPC, TLC and HPL.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSC-CHEM -505 A. 1	1	2	-	2	3	-	1	-	-	-	1	1	2	1
DSC-CHEM-505 A. 2	3	3	-	1	3	2	1	-	1	-	2	2	2	1
DSC-CHEM -505 A. 3	3	3	2	3	3	2	1	2	1	-	2	1	2	1
DSC-CHEM-505 A. 4	3	2	-	3	3	2	1	-	-	-	1	1	1	-

Unit I: Introduction and Statistical Analysis of Analytical Data

Introduction and importance of analytical chemistry. Role of instrumentation in chemical analysis. Collection, arrangement and analysis of analytical data. Types and sources of errors of analytical data, determinate and indeterminate errors, absolute and relative errors. Normal or Gaussian error curve, accuracy and precision, statistical terms (mean, median, standard deviation, %RSD and variance). Criteria of validity or rejection of result (Q-test). Numerical problems. **(15 Lectures)**

Unit II: Separation Techniques

Solvent extraction : Classification, principle and efficiency of the technique. Mechanism of Extraction: Extraction by solvation and chelation. Techniques of extraction: Batch, Continuous and Counter current extractions.

Qualitative and Quantitative aspects of solvent extraction: Extraction of metal ions from aqueous solution. Extraction of organic species from the aqueous and non-aqueous media.

Chromatography : Definition, principle, classification andefficiency of the technique. Mechanism of separation: adsorption, partition & ion–exchange mechanism. Development of chromatograms: frontal, elution and displacement methods.

Qualitative and quantitative aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC and HPL.

Applications of chromatographic techniques: In metal ion separation, deionization of water and analysis of pharmaceutical products. **(15 Lectures)**

Unit III: Optical methods of analysis

UV - Visible spectrometry : Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy, selection rules and validity of Beer-Lambert law. Basic principles of instrumentation (choice of source, monochromator and detector), Single and double beam spectrophotometers.

Application in quantitative analysis - Determination of metal ions from aqueous solution, geometrical isomers, determination of composition of metal complexes using Job's method of continuous variation and mole ratio methods.

IR and atomic Absorption / Emission Techniques: Infrared spectrometry; basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instruments, sampling techniques. Structural illustration through interpretation of data, effect of hydrogen bonding.

Flame atomic absorption and emission spectrometry : Principle and applications in quantitative Determination of trace level of metal ions from water samples. Sources of chemical interferences and their methods of removal. **(15 Lectures)**

Unit IV : Thermal methods of analysis

Introduction and classification of thermo-analytical methods.

Thermogravimetric analysis (TGA) : definition, types of TGA, instrumentation, TGA curve, factors affecting TGA curve, calculation of percentage decomposition and composition of compounds. Applications of TGA on thermal behaviour of CuSO4.5H2O and CaC2O4.H2O. Techniques for quantitative determination of Ca(II) and Mg(II) from their mixture.

Differential thermal analysis (DTA) : Definition, theoretical basis of DTA, instrumentation, factors affecting DTA curve, applications of DTA.

Differential Scanning Calorimetry (DSC) : Definition, comparison of DTA and DSC techniques, instrumentation and applications of DSC. **(15 Lectures)**

Blue print of paper setting

Units	No. of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
UNIT-I: Introduction and Statistical Analysis of Analytical Data	15 h	2	2	1 (5M+5M)	24
UNIT-II: Separation Techniques	15 h	2	2	1 (5M+5M)	29
UNIT-III:Optical methods of analysis	15 h	2	2	1 (5M+5M)	24
Unit IV: Thermal methods of analysis	15 h	1	2	1 (5M+5M)	27
	-			1	
				(unit-II: 5M +	
				unit-IV:5M)	-
		-			104
No. of Questions	7	8	5	-	

Question paper pattern:

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10
II. Derive / Explain/Solve any SIX Out of NINE (3 Problems out of 9) 6 X 5 = 30
III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

References :

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th Edition, Printice-Hall Of India Limited, NewDelhi,
2. Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley And Sons, New York.
3. K. L. Kapoor, A Textbook of Physical chemistry, (volume-2 and 3) Macmillan, IndiaLtd,
4. The Elements of Physical Chemistry (3rd edition) - Peter Atkins, Oxford Univ.Press.
5. Willard, H. H., Merritt, L. L., Dean, J. & Settoe, F. A. Instrumental Methods of Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
6. Christian, G.D; Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
7. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
8. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.
9. Skoog, D. A. Holler F. J. & Nieman, T. A. Principles of Instrumental Analysis, Cengage Learning India Ed.

DEPARTMENT OF CHEMISTRY (U. G.)

SYLLABUS Semester- V-1 Practical (CBCS)

Analytical Techniques-I DSE-CHEM-505A LAB

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credit : 1**

Course objective : This course (DSE-CHEM-505A LAB) will enable the students to

1. Demonstrate the chromatographic techniques to separate the organic mixture.

Course Outcomes : After successfully completion of the course, student are able to;

DSC-CHEM-505 A-LAB. 1. Apply the qualitative and quantitative techniques in separation of natural materials.
DSC-CHEM-505 A-LAB. 2. Perform the chromatographic techniques to separate the organic mixture.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSC-CHEM-505A-LAB.1	3	3	2	3	3	2	1	2	1	-	-	2	2	1
DSC-CHEM -505A-LAB.2	3	3	2	3	3	2	1	2	1	-	-	2	2	1

Physical chemistry experiments

1. Paper chromatographic separation of Fe^{3+}, Al^{3+}, and Cr^{3+} ions.
2. Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the Rfvalues.
3. Separation of mixture of Sudan yellow 3G and Sudan Red G by TLC technique and identify them on the basis of their Rfvalues.
4. Chromatographic separation of the active ingredients of plants, flowers and juices by TLC.
5. Determination of transition temperature of the salt hydrates ($Na_2S_2O_3.2H_2O$, $CH_3COONa.H2O$).
6. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.
7. Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometrictechniques.
8. Analysis of soil: (i) Determination of pH of soil. (ii) Total soluble salt and(iii) Determination of calcium, magnesium, phosphate, and nitrate.
9. Ion exchange:
   (i) Determination of exchange capacity of cation exchange resins and anion exchange resins.
   (ii) Separation of metal ions from their binary mixture.
   (iii) Separation of amino acids from organic acids by ion exchange chromatography.

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical assessment	:	15 marks
Semester end practical examination	:	35 marks
Total:	**:**	**50 Marks**

Distribution of marks

Accuracy	:	16
Technique and Presentation	:	06
Calculation	:	04
Practical record	:	04
Viva	:	05
Total	:	35

References :

1. Jeffery, G. H., Bassett, J., Mendham, J. & Denney, R.C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
2. Willard, H. H., Merritt, L. L., Dean, J. &Settoe, F. A. Instrumental Methods of Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Christian, G. D; Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
4. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
5. Khopkar, S. M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.
6. Skoog, D. A. Holler F. J. & Nieman, T. A. Principles of Instrumental Analysis, Cengage Learning India Ed.
7. A Handbook of Organic Analysis – Clarke andHayes
8. Experiments in Physical chemistry - Shoemaker and Garland, McGraw Hill International edn
9. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co.Pvt.
10. N. S.Ganapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S.Viswanathan Co. Pvt.,
11. Gurthu and R. Kapoor, Advanced Experimental Chemistry (Organic), S. Chand and Co.,

DEPARTMENT OF CHEMISTRY (U. G.)

SYLLABUS Semester-V-2 Theory (CBCS)

Materials of Industrial Importance And Spectroscopy DSE-CHEM-505B

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credit : 4**

Course objectives: This course (DSE-CHEM-505B) will enable the students to

1. Describe different types of molecular spectroscopic techniques
2. Illustrate Types and manufacture methods of ceramics
3. Understand structure and synthesis of Heterocyclic Compounds.
4. Expalin molecular spectroscopic and radiation chemistry.

Course Outcomes: After successfully completion of the course, student are able to;

DSC-CHEM-505 B.1- Relate the composition of glass, ceramics and surfacecoatings.
DSC-CHEM-505 B.2- Illustrate the isolation, structural constitution and synthesis of natural products .
DSC-CHEM-505 B.3- Distinguish different types of molecular spectroscopic techniques.
DSC-CHEM-505 B.4- Explain the application of basic laws and concepts of photochemistry and radiation chemistry.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSC-CHEM -505 B.1	2	3	3	3	2	-	3	3	-	-	-	-	1	-
DSC-CHEM -505 B. 2	1	3	2	2	2	-	1	3	-	-	1	2	2	1
DSC-CHEM -505 B. 3	3	1	2	2	2	-	3	2	2	-	-	1	2	-
DSC-CHEM -505 B.4	1	2	-	2	3	-	1	-	-	-	1	1	-	1

UNIT I: Glass, Ceramics and Surface coatings

Glass: Raw materials, Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture of glass by tank furnace and pot furnace. Composition, properties and uses of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass and photosensitive glass.

Ceramics: Types and manufacture methods. High technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes, carbon nanotubes and carbon fibre.

Surface Coatings : Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electrodeless), metal spraying and anodizing. **(15 Lectures)**

UNIT II: Organic chemistry

Heterocyclic Compounds: Definition, classification with examples, synthesis of furan, thiophene, pyrrole, pyridine, indole (Fischer method) quinoline (Skrup's synthesis with mechanism), isoquinoline, pyrimidine (one method

each), aromaticity and basicity of pyrrole and pyridine. Electrophillic substitution reactions of pyrrole and pyridine.

Alkaloids : Definition, classification based on heterocyclic rings, Hoffman's exhaustive methylation. Isolation, synthesis and structural elucidation of Nicotine and Coniine.

Drugs : Definition and classification. Requirements of an ideal drug. Synthesis of Paracetamol, Chloroquine, Novacaine, Sulphanilamide&Sulphaguanidine.

Terpenes : Definition, isoprene rule, classification and isolation (solvent extraction and steam distillation). Structural elucidation of Citral and its synthesis, structural formulae of a-Terpeniol, Camphor and Menthol. **(15 Lectures)**

UNIT III: Photochemistry&Radiation Chemistry

Photochemistry : Laws of photochemistry –Grotthus-Draper law of photochemical activation and Einstein's law of photochemical equivalence, quantum efficiency, reasons for low quantum yield (HBr formation as example) and high quantum yield (HCl formation as example), actinometry – Uranyl oxalate actinometer.

Radiation Chemistry: Definition, primary and secondary stages in radiochemical reactions,ionic yield, energy yield, comparison with photochemistry, units of radiation – Rad, Gray, Sievert and Roentgen, Dosimeter – Fricke dosimeter, theories of radiolysis – Lind's and EHT theories. Radiolysis of water, benzene and acetic acid.**(15 Lectures)**

UNIT IV: Molecular Spectroscopy

Regions and types of spectra, microwave spectra–rotationalspectra of diatomic molecules, moment of inertia (expression to be derived). Expression for rotational energy, selection rule and transition equal spacing between rotational spectral lines, effect of isotopic substitution taking example of $^{12}C^{16}O$ and $^{13}C^{16}O$, calculation of bond length.

Vibrational spectra of diatomic molecules – force constant (no derivation), expression for vibrational energy, zero point energy, selection rule and transitions. Vibrational modes of polyatomic molecules taking H_2O and CO_2 molecules as examples.

Electronic Spectra: Potential energy curves for bonding and anti-bonding molecular orbitals, band theory, electronic transitions, qualitative description of non-bonding orbitals and transition between them. Selection rule and Franck Condon principle. **(15 Lectures)**

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Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit-I: Glass, Ceramics, Surface coatings	15 h	2	2	1 (5M+5M)	24
Unit-II: Organic chemistry	15 h	2	2	1 (5M+5M)	29
Unit-III: Photochemistry & Radiation Chemistry	15 h	2	2	1 (5M+5M)	24
Unit-IV: Molecular Spectroscopy	15 h	1	2	1 (5M+5M)	27
	-			1	-
				(unit-II: 5M + unit-IV:5M)	
					104
No. of Questions		7	8	5	-

Question paper pattern:

Time: 3Hrs Max Marks: 70

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I.	Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7)	5 X 2 = 10
II.	Derive / Explain/Solve any SIX Out of NINE (3 Problems out of 9)	6 X 5 = 30
III.	Derive / Describe in detail any THREE out of FIVE	3 X10 = 30

References :

1. Heterocyclic Chemistry, 1 January 2005, Gilchrist
2. Heterocyclic Chemistry 6Th Edition 2020 by Professor Raj K Bansal, New Age International (P) Ltd Publishers
3. Heterocyclic Chemistry 3Rd Edition By Gilchrist And Thomas L, Pearson India
4. Atomic and Molecular Spectroscopy by Rita Kakkar (Author)
5. Fundamentals Of Molecular Spectroscopy by Colin N Banwell and Elaine M McCash , McGraw Hill
6. Callister'S Materials Science And Engineering (With Cd) 2Nd Edition by R AlasubramaniaM, Wiley India

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS Semester-V-2-Practical (CBCS)

Analytical Techniques-II DSE-CHEM-505B LAB

Teaching Hours : 30 **CIA Marks : 10**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credit : 1**

Course objective: This course (DSE-CHEM-505B LAB) will enable the students to

1. quantitative determine in volumetric and gravimetric analysis

Course Outcome: After successfully completion of the course, student are able to;

DSC-CHEM-505 B-LAB. 1-Develop skills for quantitative determination in volumetric and gravimetric analysis

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSC-CHEM -505B-LAB.1	2	3	1	2	2	2	1	1	1	2	-	1	1	2

Gravimetric Determinations :

1. Determination of barium as barium sulphate.
2. Determination of iron as iron (III) oxide.
3. Determination of copper as copper (I) thiocyanate.
4. Determination of nickel as nickel-dimethylglyoxime complex.
5. Determination of magnesium as magnesium -8-hydroxy quinoline (oxine).
6. Determination of aluminum as aluminum oxide.
7. Determination of zinc as zinc oxide.

Ore analysis :

1. Preparation of standard potassium dichromate solution and Determination of iron in the given sample of hematite by dichromate method.
2. Determination of percentage of calcium in limestone by oxalate method.
3. Determination of magnesium in the given sample of dolomite by EDTA method.

Alloy Determinations :

1. Determination of copper in bronze by iodometric method.
2. Determination of tin in solder using EDTA.

Experiments on Inorganic Chemistry (Volumetric/Gravimetric) :

1. The candidates should perform 10experiments.
2. Practical examination is of 4 hoursduration.
3. The candidate has to score minimum 50% marks for passing the practicalexamination.
4. Continuous internal practical assessment (5+10) : 15marks
5. Semester end practical examination should be conducted for35marks

Inorganic VolumetricAnalysis :

	Distribution ofmarks	**:**	**Distribution ofmarks:**
1.	Accuracy (TitrateValues2X8)	:	18
2.	ProperTechnique &Calculation	:	08
3.	Practical Record	:	05
4.	Viva-voce	:	05
		:	**Total = 35 marks**

Variation of experimental results	**Marks**
± 0.2 cc	16
± 0.4 cc	14
± 0.6 cc	12
± 0.8 cc	08
± 1.0 cc and above	00

I. Inorganic Gravimetric

Analysis: Distribution of 3 5 marks :

1.	Accuracy	:	18
2.	Techniqueand Calculation	:	08
3.	Practicalrecord	:	05
4.	Viva-voce	:	05
			Total = 35 marks

Scheme of Marking :

Variation of experimental results	Marks
Less than 6mg	16
7 - 8 mg	14
9 – 10 mg	12
10-12 mg	08
Above 12 mg	00

References :

1. Jeffery, G. H., Bassett, J., Mendham, J. & Denney, R. C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
2. Willard, H. H., Merritt, L. L., Dean, J. & Settoe, F. A. Instrumental Methods of Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Christian, Gary D; Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
4. Harris, Daniel C: Exploring Chemical Analysis, Ed. New York, W. H. Freeman, 2001.
5. Khopkar, S. M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.
6. Skoog, D. A. Holler F. J. &Nieman, T. A. Principles of Instrumental Analysis, Cengage Learning India Ed.
7. Mikes, O. Laboratory Hand Book of Chromatographic & Allied Methods, Elles Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.
8. Ditts, R. V. Analytical Chemistry; Methods of Separation, van Nostrand, 1974.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-V-SEC-1 Theory (CBCS)
Corrosion, Batteries And Catalysis SEC-CHEM-505A

Teaching Hours : 30 **CIA Marks : 15**
Examination Hoursb : 3 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credit : 1**

Course objectives: This course (SEC-CHEM-505A) will enable the students to

1. Classify and explain corrosion techniques to monitor (classical and electrochemical methods) and control corrosion
2. explain Working of following batteries: Pb acid, Li battery, solid state electrolyte battery
3. understand General principles and properties of catalysis

Course Outcomes : After successfully completion of the course, student are able to;

SEC-CHEM-505A.1- Explain different energy sources and their effect on environment.
SEC-CHEM-505A.2- Learn the use of different catalysts in the industrial processes

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM -505A.1	2			2							3	3	3	3
SEC-CHEM -505A.2											3	3	3	3

Unit I: Corrosion and its control

Introduction, factors influencing the corrosion, consequences and importance of corrosion, classification and theories of corrosion, techniques to monitor (classical and electrochemical methods) and control corrosion (inhibitors, protection coating, anodic and cathodic protection, lubrication, electroplating and painting). **(10Lectures)**

Unit II: Batteries

Primary and secondary batteries, battery components and their role, characteristics of battery. Working of following batteries: Pb acid, Li battery, solid state electrolyte battery. Fuel cells and solar cell. **(10Lectures)**

Unit III: Catalysis

General principles and properties, homogenous catalysis (catalytic steps and examples) and heterogeneocus catalysis (catalytic steps and examples) and their industrial applications. Deactivation or regeneration of catalysts. Phase transfer catalysis, application of zeolites as catalysts. **(10 Lectures)**

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Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit I: Corrosion and itscontrol	10 h	3	2	1 (5M + 5M)	21
Unit II: Batteries	10 h	2	2		19
Unit III: Catalysis	10 h	2 1		1 (5M + 5M)	19
		-			59
No. of Questions		7	5	2	-

Question paper pattern:

Time: 1.5 Hour **Max Marks: 35**

Instructions : 1. Answer all the sections.
2. Draw the neat labelled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (5 X 2 = 10)
II. Derive / Explain/Solve any THREE Out of FIVE (3 X 5 = 15)
III. Derive / Describe in detail any ONE out of TWO (1 X10 =10)

References :

1. Willard, H.H., Merritt, L.L., Dean, J. &Settoe, F.A. Instrumental Methods ofAnalysis. 7th Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
2. Skoog, D.A.; West, D.M. & Holler, F.J. Fundamentals of Analytical Chemistry 6thEd., Saunders College Publishing, Fort Worth (1992).

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-V-SEC-1 Practical(CBCS)
Corrosion, Batteries And Catalysislab SEC-CHEM-505A-LAB

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credit : 1**

Course objectives: This course (SEC-CHEM-505A-LAB) will enable the students to

1. Construction of Zinc & Copper electroplating process
2. Construction of Tin electroplating process
3. Study of corrosion of some metals/alloys
4. Effect of catalyst in homogeneous catalysis

Course Outcomes : After successfully completion of the course, student are able to;

SEC-CHEM-505A-LAB.1- Discuss the functioning of catalyst in electrochemical process.
SEC-CHEM-505A-LAB.2- Outline the use of metals/alloys in electrochemical process.

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM -505A-LAB.1	2			2						1	3	3	3	3
SEC-CHEM -505A-LAB.2	2			2						1	3	3	3	3

List of Physical chemistry experiments

1. Construction of copper electroplating process
2. Construction of Zinc electroplating process
3. Construction of Tin electroplating process
4. Study of corrosion of some metals/alloys
5. Effect of catalyst in homogeneous catalysis
6. Effect of catalyst in heterogeneous catalysis
7. Design of galvanic cells.

Scheme of Evaluation
Distribution of marks

Chemistry practical examination consists of two parts
Continuous internal practical assessment : 15 marks
Semester end practical examination : 35 marks
Total: : 50 Marks

Distribution of marks

Accuracy	:	12
Technique and presentation	:	08
Calculation	:	06
Practical record	:	04
Viva	:	05
Total	:	35

References :

1. Willard, H.H., Merritt, L.L., Dean, J. &Settoe, F.A. Instrumental Methods ofAnalysis. 7th Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
2. Skoog, D.A.; West, D.M. & Holler, F.J. Fundamentals of Analytical Chemistry 6thEd., Saunders College Publishing, Fort Worth (1992).
3. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.
4. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
5. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
6. Vogel, A. I. Vogel's Qualitative Inorganic Analysis 7th Ed., Prentice Hall.
7. Robinson, J.W. Undergraduate Instrumental Analysis 5th Ed., Marcel Dekker, Inc., New York (1995).

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-V-SEC-2 Theory (CBCS)

Chemical Technology, Pesticide Chemistry And Fertilizers SEC-CHEM-505B

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credit : 1**

Course objectives: This course (SEC-CHEM-505B) will enable the students to

1. understandBasic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction
2. expalin benefits and adverse effects, changing concepts of pesticides
3. Differentiate types of fertilizers and Manufacture of NPK fertilizers

Course Outcomes: After successfully completion of the course, student are able to;

SEC-CHEM-505B.1- Prepare of pesticides and fertilizers on large scale.
SEC-CHEM-505B.2- Distinguish the modern techniques- solvent extraction and adsorption in chemical process.

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM-505B.1	1			2				1			3	3	3	3
SEC-CHEM-505B.2	2			2					1		3	3	3	3

Unit I : Chemical Technology

Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills and emulgators. Scaling up operations in chemical industry. Introduction to clean technology. **(10 Lectures)**

Unit II: Pesticide Chemistry

General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor). **(12 Lectures)**

Unit III : Fertilizers

Different types of fertilizers. Manufacture of NPK fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride and potassium sulphate. **(08 Lectures)**

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Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit I: Chemical Technology	10 h	3	2	1 (5M + 5M)	21
Unit II: Pesticide Chemistry	10 h	2	2		19
Unit III: Fertilizers	10 h	2	1	1 (5M + 5M)	19
		-			59
No. of Questions		7	5	2	-

Question paper pattern :

Time: 1.5 Hour **Max Marks: 35**

Instructions: 1. Answer all the sections.
2. Draw the neat labelled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (5 X 2 = 10)
II. Derive / Explain/Solve any THREE Out of FIVE (3 X 5 = 15)
III. Derive / Describe in detail any ONE out of TWO (1 X10 =10)

References :

1. Cremlyn, R. Pesticides. Preparation and Modes of Action, John Wiley & Sons, New York, 1978.
2. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.
3. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
4. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
5. Freifelder, D. Physical Biochemistry 2nd Ed., W.H. Freeman and Co., N.Y. USA (1982).
6. Cooper, T.G. The Tools of Biochemistry, John Wiley and Sons, N.Y. USA. 16 (1977).
7. John W. Hill, Terry W. McCreary & Doris K. Kolb, Chemistry for changing times 13th Ed.
8. Bray, R. H. and Kurtz, L. T. (1945). Determination of total organic and available forms of phosphorus in soil. Soil Science. 59: 39–45.
9. Chesnin, L. and Yien, C.H. (1950). Turbidimetric determination of available sulphates. Proc. Soil Sci. Soc. Am. 15:149-151.
10. Jackson, M. L. (1973). Soil Chemical Analysis. Prentice Hall of India (Pvt.) Ltd., New Delhi.
11. Lindsay, W.L. and Norvell, W.A. (1978). Development of a DTPA soil test for zinc, iron, manganese and copper. Soil Science Society of America. 42: 421-428.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-V-SEC-2 Practical (CBCS)

Corrosion, Batteries And Catalysis lab SEC-CHEM-505B-LAB

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credit : 1**

Course objectives : This course (SEC-CHEM-505B-LAB) will enable the students to

1. Determine pH and conductivity of soil samples
2. Determine calcium in calcium ammonium nitrate fertilizer
3. Determine potassium content in Soils using flame photometer
4. Determine zinc in a zinc containingfungicide using EDTA

Course Outcomes : After successfully completion of the course, student are able to;

SEC-CHEM-505B-LAB.1- Indentify the employability related analysis of inorganic and organic substances.

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM-505B -LAB.11	1	2		1						2	3	3	3	3

List of Experiments

1. Determination of pH and conductivity of soil samples
2. Determination of free acidity in ammonium sulphate fertilizer
3. Determination of calcium in calcium ammonium nitrate fertilizer
4. Determination of potassium content in Soils using flame photometer.
5. Determination of potassium content in fertilizers using flame photometer
6. Determination of total phosphorus in a soil sample by colorimetric method.
7. Determination of total sulphur in a soil sample by colorimetric method
8. Determination of copper pesticides by iodometric method
9. Determination of zinc in a zinc containingfungicide using EDTA.

Scheme of Evaluation
Distribution of marks

Chemistry practical examination consists of two parts
Continuous internal practical assessment : 15 marks
Semester end practical examination : 35 marks
Total: : 50 Marks

Distribution of marks

Accuracy	:	16
Technique and Presentation	:	06
Calculation	:	04
Practical record	:	04
Viva	:	05
Total	**:**	**35**

References :

1. Cremlyn, R. Pesticides. Preparation and Modes of Action, John Wiley & Sons, New York, 1978.
2. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.
3. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
4. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
5. Freifelder, D. Physical Biochemistry 2nd Ed., W.H. Freeman and Co., N.Y. USA (1982).
6. Cooper, T.G. The Tools of Biochemistry, John Wiley and Sons, N.Y. USA. 16 (1977).
7. John W. Hill, Terry W. McCreary & Doris K. Kolb, Chemistry for changing times 13th Ed.
8. Bray, R. H. and Kurtz, L. T. (1945). Determination of total organic and available forms of phosphorus in soil. Soil Science. 59: 39–45.
9. Chesnin, L. and Yien, C.H. (1950). Turbidimetric determination of available sulphates. Proc. Soil Sci. Soc. Am. 15:149-151.
10. Jackson, M. L. (1973). Soil Chemical Analysis. Prentice Hall of India (Pvt.) Ltd., New Delhi.
11. Lindsay, W.L. and Norvell, W.A. (1978). Development of a DTPA soil test for zinc, iron, manganese and copper. Soil Science Society of America. 42: 421-428.
12. Subbaiah, B. V. and Asija, G. L. (1956). A rapid procedure for the Determination of available nitrogen in soil. Current Science. 25: 259–260.
13. Tai, Y. P. and Young, C. T. (1974). Variation in Protein Percentage in Different Portions of Peanut Cotyledons 1. Crop science, 14(2): 227-229.
14. Walkley, A. and Black, I.A. (1934). An Examination of Degtjareff Method for Determining Soil Organic Matter and a Proposed Modification of the Chromic Acid Titration Method. Soil
15. Chemistry of Insecticides and Fungicides-U.S. SreeRamulu.
16. Methods of Pesticide analysis-U.S. SreeRamulu.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- VI-1 Theory (CBCS)

Novel Materials, Spectroscopy And Polymers DSE-CHEM-606A

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credit : 4**

Course objectives : This course (DSE-CHEM-606A) will enable the students to

1. Synthesis inorganic solids and nanoparticles.
2. Understand applications of UV and IR Spectroscopy.
3. Explain Principle of nuclear magnetic resonance
4. Identify Functionality and importance of polymer chemistry

Course Outcomes : After successfully completion of the course, student are able to;

DSC-CHEM-606 A.1- Identify different types of nano-materials and their synthesis.
DSC-CHEM-606 A.2- Discuss the uses of UV, IR and NMR spectroscopy techniques to organic molecules.
DSC-CHEM-606 A.3- Illustrate the preparation and synthesis of different type's polymers.
DSC-CHEM-606 A.4- Identify importance of polymer chemistry

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSCCHEM-606 A.1	3	3	2	1	1	-	1	2	-	-	1	-	1	1
DSCCHEM-606 A.2	3	3	-	3	3	2	1	-	-	-	1	1	2	1
DSCCHEM-606 A.3	3	3	-	3	3	2	1	-	-	-	1	1	2	1
DSCCHEM-606 A.4	3	3	2	2	3	-	1	2	1	-	1	-	1	1

Unit I: Novel Inorganic Solids / Nanomaterials

Synthesis and modification of inorganic solids : Conventional heat and beat methods, Coprecipitation method, Sol-gel method, Hydrothermal method, Ion-exchange and Intercalation method. Nanomaterials: Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control. Carbon nanotubes and inorganic nanowires. Bio-inorganic nanomaterials, natural and syntheticnanomaterials, bio-nano composites.**(15 Lectures)**

Unit II: Applications of UV and IR Spectroscopy

Electromagnetic radiations, electronic transitions, λ_{max} & ε Chromophore, auxochrome, bathochromic, hypsochromic, hypochromic and hyperchromic shifts. Applications of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes and α, ß-unsaturated compounds (ketones). Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions). **(15 Lectures)**

Unit III: 1H NMR Spectroscopy

Nuclear Magnetic Resonance (NMR) Spectroscopy : Principle of nuclear magnetic resonance, number of signals, peak areas, equivalent & non-equivalent protons, positions of signals, chemical shift, factors affecting chemical shift. Shielding &deshielding of protons, proton counting, splitting of signals & coupling constants, magnetic equivalence of protons. Discussion of PMR spectra of molecules- ethyl bromide, n–propyl bromide, isopropyl bromide 1,1-dibromoethane, 1,1,2- tribromoethane, ethanol, acetaldehyde, aniline, toluene and acetophenone.

(15 Lectures)

Unit IV: Polymer Chemistry

Functionality and its importance : Criteria for synthetic polymer formation, classification of polymerization processes, relationships between functionality, extent of reaction and degree of polymerization. Bifunctional and poly-functional systems.

Kinetics of Polymerization : Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations. Polymerization techniques. Mechanism and kinetics of copolymerization.

Polymers : Preparation, structure, properties and applications of the following polymers: polyolefins, polystyrene and styrene copolymers, polyvinyl chloride (PVC), polyamides. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, polycarbonates. Conduct ing Polymers-polyacetylene, polyaniline (PANI), poly-p-phenylene sulphide, polypyrrole and polythiophene. **(15 Lectures)**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit-I: Novel Inorganic Solids, Nanomaterials	15 h	2	2	1 (5M + 5M)	24
Unit-II: Applications of UV and IR Spectroscopy	15 h	2	2	1 (5M + 5M)	29
Unit-III: 1H NMR Spectroscopy	15 h	2	2	1 (5M + 5M)	24
Unit-IV: Polymer Chemistry	15 h	1	2	1 (5M + 5M)	27
				- 1(unit-II: 5M + unit- IV:5M)	-
		-			104
No. of Questions		7	8	5	-

Question paper pattern:

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10
II. Derive / Explain/Solve any SIX Out of NINE (3 Problems out of 9) 6 X 5 = 30
III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

References :

1. Gowariker, V. R.; Viswanathan, N. V. &Sreedhar, J. Polymer Science, New Age International (P) Ltd. Pub.
2. G. Odian: Principles of Polymerization, John Wiley.
3. F.W. Billmeyer: Text Book of Polymer Science, John Wiley.
4. P. Ghosh: Polymer Science & Technology, Tata Mcgraw-Hill.
5. R.W. Lenz: Organic Chemistry of Synthetic High Polymers.
6. Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.
7. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
8. Billmeyer, F. W. Textbook of Polymer Science, John Wiley & Sons, Inc.
9. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
10. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-VI-1Practical (CBCS)

Instrumental Methods Of Analysis lab DSE-CHEM-606 A LAB

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credit : 1**

Course objective : This course (DSE-CHEM-606 A LAB) will enable the students to

1. Determine the conductometric properties of different compounds.

Course Outcomes: After successfully completion of the course, student are able to;

DSC-CHEM-606 A-LAB. 1 Interpret the molecular structures of simple molecules using UV, IR and NMR spectral data.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSC-CHEM-606 ALAB. 1	3	3	-	3	3	2	1	-	-	-	1	1	2	1

List of physical chemistry experiments

1. Determination of solubility of sparingly soluble salt (BaSO4) by conductometric method.
2. Determination of degree of dissociation (a) and dissociation constant of a weak acid (Ka) using digital conductometer.
3. Determination of rate constant of saponification of ethyl acetate by conductivity measurements.
4. Conductometric titration of a strong acid versus a strong base and a weak acid versus a strong base.
5. Determination of percentage composition of a given mixture containing two miscible liquids using Abbe's refractometer.
6. Potentiometric titration of Fe(II) solution against potassium dichromate solution.
7. Potentiometric titration of mixture of HCl and CH3COOH using NaOH solution.
8. Colorimeteric determination of Fe3+ ion using ammonium thiocyanate as a complexing agent.
9. Colorimeteric determination of Cu2+ ion using NH4OH as a complexing agent.
10. Determination of alkali and alkaline earth metals by flame photometry.
11. UV spectral interpretation of simple molecules.
12. IR spectral interpretation of simple molecules.
13. NMR spectral interpretation of simple molecules.

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical assessment	:	15 marks
Semester end practical examination	:	35 marks
Total:	**:**	**50 Marks**

Distribution of marks

Accuracy	:	16
Technique and Presentation	:	06
Calculation	:	04
Practical record	:	04
Viva	:	05
Total	**:**	**35**

References :

1. Gowariker, V. R.; Viswanathan, N. V. &Sreedhar, J. Polymer Science, New Age International (P) Ltd. Pub.
2. G. Odian: Principles of Polymerization, John Wiley.
3. F.W. Billmeyer: Text Book of Polymer Science, John Wiley.
4. P. Ghosh: Polymer Science & Technology, Tata Mcgraw-Hill.
5. Singh, J.; Ali, S.M. & Singh, J. Natural Product Chemistry, PrajatiPrakashan (2010).
6. Kemp, W. Organic Spectroscopy, Palgrave

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-VI-2 Theory (CBCS)

Molecules of Life DSE-CHEM-606B

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 3:0:0 **Credit : 4**

Course objectives: This course (DSE-CHEM-606B) will enable the students to

1. Illustrate Mechanism of enzyme action, factors affecting enzyme action
2. Identify Biological roles of DNA and RNA: Replication, Transcription and Translation
3. Define, understand the Structure and classification of lipids
4. Outline of catabolic pathways of Carbohydrate.

Course Outcomes: After successfully completion of the course, student are able to;

DSC-CHEM-606 B. 1 Write the structure of nucleic acids and further their biological role of DNA and RNA.
DSC-CHEM-606 B. 2. Discuss concepts of energy transfer in bio-systems.
DSC-CHEM-606 B. 3- Illustrate behaviour of drugs towards enzyme using stereo-chemical aspects.
DSC-CHEM-606 B. 4- Explain the classification of lipids, vitamins and hormones and their importance in bio-system

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSCCHEM-606 B.1	1	-	1	-	1	-	-	-	2	-	-	1	-	1
DSCCHEM-606 B.2	1	-	1	-	1	-	-	-	2	-	1	-	1	-
DSCCHEM-606 B.3	2	1	1	-	1	1	2	-	1	-	2	1	1	-
DSCCHEM-606 B.4	1	3	3	2	-	-	1	2	-	-	1	-	-	-

Unit-I: Enzymes and correlation with drug action

Mechanism of enzyme action, factors affecting enzyme action. Coenzymes and co-factors and their role in biological reactions, enzyme specificity and its types. Stereospecificity of enzyme action, enzyme inhibitors and their importance, phenomenon of inhibition (Competitive and non-competitive inhibition including allosteric inhibition).

Drug action-receptor theory. Structure–activity relationships (SAR) of drug molecules, binding role of –OH, -NH_2 group, double bond and aromatic ring. **(16 Lectures)**

Unit II: Nucleic Acids

Components of nucleic acids: Adenine, guanine, thymine and Cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (nomenclature), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic code. Biological roles of DNA and RNA: Replication, Transcription and Translation. **(14 Lectures)**

Unit-III: Lipids, Vitamins and Hormones

Oils and Fats: Definition, Structure and classification of lipids. Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number. Biological importance of trigycerides, phospholipids, and steroids (Cholesterol).

Vitamins : Definition and classification. Source, structure and Biological significance of Vitamins-A, B1 (thiamine), B2 (Riboflavin), B6 (Pyridoxine), a-tocopherol, K1(phylloquinone), C(ascorbic acid). Van Drop synthesis of Vitamin A and synthesis of Vitamin C from D-glucose.

Hormones : Definition, classification of hormones with examples, functions and deficiency. Synthesis of adrenaline and thyroxine. **(16 Lectures)**

Unit-IV: Concept of Energy in Biosystems

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of food stuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, and Krebs cycle. **(14 Lectures)**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit-I: Enzymes and correlation with drug action	15 h	2	2	1 (5M + 5M)	24
Unit II: Nucleic Acids	15 h	2	2	1 (5M + 5M)	29
Unit III: Lipids, Vitamins and Hormones:	15 h	2	2	1 (5M + 5M)	24
Unit-IV: Concept of Energy in Biosystems	15 h	1	2	1 (5M + 5M)	27
				- 1 (unit-II: 5M + unit- IV:5M)	-
		-			104
No. of Questions		7	8	5	-

Question paper pattern:

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the sections.
2. Draw the neat labeled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (2 Problems out of 7) 5 X 2 = 10
II. Derive / Explain/Solve any SIX Out of NINE (3 Problems out of 9) 6 X 5 = 30
III. Derive / Describe in detail any THREE out of FIVE 3 X10 = 30

Reference :

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006) Biochemistry. VIth Edition. W.H. Freeman and Co.
2. Nelson, D.L., Cox, M.M. and Lehninger, A.L. (2009) Principles of Biochemistry. IV Edition.W.H. Freeman and Co.
3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009) Harper's Illustrated

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- VI-2 Practical (CBCS)
Biochemical Analysis DSE-CHEM-606B-LAB

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credit : 1**

Course objectives: This course (DSE-CHEM-606B-LAB) will enable the students to

1. Demostrate qualitative test for carbohydrates and lipids.
2. Extract and determineof density , viscosity and surface tension of edible oils

Course Outcomes: After successfully completion of the course, student are able to;

DSC-CHEM-606 A-LAB. 1Demonstrate the qualitative and quantitative tests of bio-molecules.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2	PSO-3	PSO-4
DSC-CHEM-606 ALAB. 1	3	3	-	3	3	2	1	-	-	-	1	2	2	1

List of experiments :

1. Separation of amino acids by thin layer chromatography
2. Qualitative test for carbohydrates
3. Qualitative test for lipids
4. Qualitative test for amino acids and proteins
5. Concept of pH and preparation of buffer solutions
6. Determination of vitamin C in fruit juices
7. Determination of iodine number in a vegetable oil
8. Extraction and determination of density of edible oils
9. Extraction and determination of viscosity of edible oils
10. Extraction and determination of surface tension of edible oils

Scheme of Evaluation
Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical Assessment : 15 marks
Semester end practical examination : 35 marks
Total: : 50 Marks

Distribution of marks

Determination/Extraction	:	20
Technique and presentation	:	05
Practical record	:	05
Viva	:	05
Total	**:**	**35**

Reference :

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006) Biochemistry. VIth Edition. W.H. Freeman and Co.
2. Nelson, D.L., Cox, M.M. and Lehninger, A.L. (2009) Principles of Biochemistry. IV Edition.W.H. Freeman and Co.
3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009) Harper's Illustrated Biochemistry. XXVIII edition.Lange Medical Books/ McGraw-Hill.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-VI-SEC-1 Theory (CBCS)

CHEMISTRY OF FUELS SEC-CHEM-606A

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credit : 1**

Course objectives : This course (SEC-CHEM-606A) will enable the students to

1. Classify fuels and calculate their calorific value.
2. Classification of fuels and their calorific value.
3. understand reforming of Petroleum and non-petroleum fuels

Course Outcomes : After successfully completion of the course, student are able to;

SEC-CHEM-606A.1-Recall the different types of energy resources and their compositions.
SEC-CHEM-606A.2-Correlate the importance of the products obtained from biomass and biowaste.
SEC-CHEM-606A.3-List the use of petroleum and petroleum products in day to day life.

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM-606A.1	1			2							3	3	3	3
SEC-CHEM-606A.2	1			2				1			3	3	3	3
SEC-CHEM-606A.3	1			2							3	3	3	3

Unit I: Fuels

Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas and their composition and uses. Coal gasification (Hydro gasification and Catalytic gasification). Coal liquefaction and Solvent Refining. **(08 Lectures)**

Unit-II: Biofuels

Introduction, biofuels derived from biomass,biowaste and by various feedstock.

Bioethanol : properties, bioethanol production from sugar and starch feedstock. Environmental aspects of ethanol as a biofuel.

Biomethanol : Principles and materials, biomethanol production from biomass. Advantages and limitations.

Biohydrogen : Biological hydrogen production methods – Fermentative hydrogen production/ hydrogen economy- Advantages and limitations.

Bioreactor design for biofuel production : Fermentation process and types of fermenters. Bioreactor and design. **(12 Lectures)**

Unit III: Petroleum and Petrochemical Industry

Composition of crude petroleum, Refining and different types of petroleum products and their applications.Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking). Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, synthetic fuels (gaseous and liquids), clean fuels.

Petrochemicals : Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives.

Lubricants : Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. **(10 Lectures)**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit I: Fuels	10 h	3	2	1 (5M + 5M)	21
Unit-II: Biofuels	10 h	2	2	19	
Unit III: Petroleum and Petrochemical Industry	10 h	2	1	1 (5M + 5M)	19
		-			59
No. of Questions		7	5	2	-

Question paper pattern:

Time: 1.5 Hour **Max Marks: 35**

Instructions : 1. Answer all the sections.
2. Draw the neat labelled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (5 X 2 = 10)
II. Derive / Explain/Solve any THREE Out of FIVE (3 X 5 = 15)
III. Derive / Describe in detail any ONE out of TWO (1 X10 =10)

References :

1. Stocchi, E. Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK (1990).
2. Jain, P.C. & Jain, M. Engineering Chemistry DhanpatRai& Sons, Delhi.
3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
4. The physics of solar cells (Properties of semiconductor Materials) by Jenny Nelson.
5. Physics of Solar cells: from basic principle to Advanced Concepts. Physics text book by Peter Wurfel.
6. Optoelectronics of Solar Cells (SPIE Press Monograph Vol. PM115), Greg P. Smestad

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-VI-SEC-1 Practical (CBCS)

BIOFUELS AND SOLAR CELLS SEC-CHEM-606A LAB

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credit : 1**

Course objectives : This course (SEC-CHEM-606ALAB) will enable the students to

1. Prepare biodiesel by Trans-esterification o fedible oils
2. understand Applications of Solar Energy

Course Outcomes : After successfully completion of the course, student are able to;

SEC-CHEM-606ALAB.1- Explain the importance of fermentation in sugar industry and fruit extraction.
SEC-CHEM-606ALAB.2- Discuss the Trans-esterification process in the preparation of biodiesel.
SEC-CHEM-606ALAB.3- Recall the application of solar energy

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM-606A LAB.1 1	2			1							3	3	3	3
SEC-CHEM-606A LAB.2 1	2			1							3	3	3	3
SEC-CHEM-606A LAB.3 2	2										3	3	3	3

List of Experiments

1. Preparation of biodiesel by Trans-esterification of the following
   a) Vegetable waste
   b) Vegetable oils
   c) Seed oils
   d) Fats.
2. Fermentation
   a) Sugar industry waste using yeast
   b) Fruit extracts
3. Applications of Solar Energy
   a) Solar cells
   b) Solar lamp
   c) Solar cooker

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical Assessment	:	15 marks
Semester end practical examination	:	35 marks
Total:	**:**	**50 Marks**

Distribution of marks

Determination/Extraction	:	20
Technique and presentation	:	05
Practical record	:	05
Viva	:	05
Total	**:**	**35**

References :

1. Stocchi, E. Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK (1990).
2. Jain, P.C. & Jain, M. Engineering Chemistry DhanpatRai& Sons, Delhi.
3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
4. The physics of solar cells (Properties of semiconductor Materials) by Jenny Nelson.
5. Physics of Solar cells: from basic principle to Advanced Concepts. Physics text book by Peter Wurfel.
6. Optoelectronics of Solar Cells (SPIE Press Monograph Vol. PM115), Greg P. Smestad

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-VI-SEC-2 Theory (CBCS)
Chemistry of Cosmetics SEC-CHEM-606B

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credit : 1**

Course objectives: This course (SEC-CHEM-606B) will enable the students to

1. Classify cosmetics, Quality characteristics and Quality Assurance Development Process of Cosmetics
2. Excipients & its applications in cosmetics

Course Outcomes: After successfully completion of the course, student are able to;

SEC-CHEM-606B.1- Choose cosmetics based on quality characteristics and safety.
SEC-CHEM-606B.2- Compare the use of oily materials, surface active agents, humectants and antioxidants.
SEC-CHEM-606B.3- Examine quality of cosmetics.

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM-606B.1	1		1	2							3	3	3	3
SEC-CHEM-606B.2	1			2							3	3	3	3
SEC-CHEM-606B.3	1		1	1							3	3	3	3

Unit-I: Introduction of Cosmetics

Purposes of Cosmetics meaning of Cosmetics and cosmoceuticals. Classification of Cosmetics, Quality characteristics and Quality Assurance Development Process of Cosmetics. Scientific background technology and its future. **(10Lectures)**

Unit-II: Excipients& its applications in cosmetics

a. **Oily Materials:** Introduction, Oils and Fats, Wax, Hydrocarbons, Higher Fatty Acids, Higher Alcohols, Esters, Silicones.

b. **Surface Active Agents:** Introduction Anionic Surfactant, Cationic, Surfactants, Amphoteric Surfactant, Non-ionic, Surfactant. Other Surfactants.

c. **Humectants:** Introduction, Choice of Humectants Unusual Humectants, Special Uses of Humectants.

d. **Antioxidants:** Introduction, General Oxidative theory, Measurement of Oxidation and Assessment of Oxidantefficiency, Choice of Antioxidant. (12 Lectures)

Unit-III: Safety of Cosmetics

Basic Concept of Cosmetic Safety, Safety test items & Evaluation method: Skin irritation, sensitization, Testing on Human (Patch test, Usage test) **(08 Lectures)**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 2 Marks	Q-II: 5 Marks	Q-III: 10 Marks	Total Marks
Unit-I: Introduction of Cosmetics	10 h	3	2	1 (5M + 5M)	21
Unit-II: Excipients & its applications in cosmetics	10 h	2	2		19
Unit-III: Safety of Cosmetics	10 h	2	1	1 (5M + 5M)	19
		-			59
No. of Questions		7	5	2	-

Question paper pattern:

Time: 1.5 Hour **Max Marks: 35**

Instructions: 1. Answer all the sections.
2. Draw the neat labelled diagrams wherever necessary.

I. Define/ Write/Solve any FIVE Out of SEVEN (5 X 2 = 10)
II. Derive / Explain/Solve any THREE Out of FIVE (3 X 5 = 15)
III. Derive / Describe in detail any ONE out of TWO (1 X10 = 10)

References :

1. New Cosmetic Science by Takeo Mitsui
2. Harry's Cosmetology.
3. Cosmetic Science & Technology by Sagarin C.B.
4. Hand book of Cosmetic Science & Technology by Marc paye, Andre O. Barel.
5. Novel Cosmetic Delivery Systems by Shlomomagdass, ElkaTouitou.
6. Formulation Manufacturing & Quality Control by P.P. Sharma

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-VI-SEC-2 Practical (CBCS)

ANALYSIS OF COSMETICS SEC-CHEM-606BLAB

Teaching Hours : 30 **SEE Marks 35**
Examination Hours : 3 **Credit : 1**
Scheme (L:T:P) 0:0:3 **CIA Marks : 15**

Course objectives: This course (SEC-CHEM-606ALAB) will enable the students to

1. Identify different types of emulsions.
2. Prepare of simple herb mixtures
3. Effect of flocculating agents

Course Outcomes: After successfully completion of the course, student are able to;

SEC-CHEM-606BLAB.1- Prepare emulsions, suspensions and herb mixtures.
SEC-CHEM-606BLAB.2- Analyze the stability of suspensions and effect of flocculating agents on cosmetics

Mapping of CO with PO and PSO:

CO	PO										PSO			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
SEC-CHEM-606BLAB.1	1			2							2	2	2	2
SEC-CHEM-606BLAB.2	1										2	2	2	2

Emulsions and Suspensions Experiments

1) Identification of different types of emulsions.
2) Preparation of emulsion of oils in water.
3) Preparation of emulsion of water in oils.
4) Preparation of simple herb mixtures.
5) Preparation of suspensions.
6) Study of stability of suspensions using thickening agents.
7) Effect of flocculating agents.

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts
Continuous internal practical Assessment : 15 marks
Semester end practical examination : 35 marks
Total: : 50 Marks

Distribution of marks

Preparation / testing	:	18
Technique and presentation	:	07
Practical record	:	05
Viva	:	05
Total	**:**	**35**

References :

1. New Cosmetic Science by Takeo Mitsui
2. Harry's Cosmetology.
3. Cosmetic Science & Technology by Sagarin C.B.
4. Hand book of Cosmetic Science & Technology by Marc paye, Andre O. Barel.
5. Novel Cosmetic Delivery Systems by Shlomomagdass, ElkaTouitou.
6. Formulation Manufacturing & Quality Control by P. P. Sharma.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester-I Theory (NEP)
General Chemistry-I DSCC-CHEM(T)-101

Teaching Hours : 56 **CIA Marks : 40**
Examination Hours : 3 **SEE Marks : 60**
Scheme (L:T:P) 4:0:0 **Credit : 4**

Course objectives : This course (DSCC-CHEM(T)-101) will enable the students to

1. Fundamentals of organic chemistry
2. stereochemistry of organic compounds
3. Gas laws and properties of liquids
4. basic analytical techniques
5. Atomic structure and the periodicity of elements

Course Outcome: After successfully completion of the course, student are able to;

DSCC-CHEM(T)-101.1- Discuss the atomic structure and the periodicity of elements based on electronic configuration
DSCC-CHEM(T)-101.2- Compare the electronic effects & conformational stability in 3Dimensionalorganic molecules
DSCC-CHEM(T)-101.3- Explain the physical properties and laws governing the behavior of liquids and gases
DSCC-CHEM(T)-101.4- Examine the principles of volumetric analysis

Mapping of CO with PO :

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
DSCC-CHEM(T)-101.1	2	1								
DSCC-CHEM(T)-101.2		3								
DSCC-CHEM(T)-101.3	2	1								
DSCC-CHEM(T)-101.4	2	2								

UNIT-I: Atomic Structure And Periodicity of Elements

Atomic Structure : Review of Rutherford's atomic model, Bohr's theory, Hydrogen atomic spectra. Derivation of radius and energy of an electron in hydrogen atom., limitations of Bohr's theory, dual behavior of matter and radiation, debroglie's equation. Heisenberg uncertainty principle and their related problems. Schrodinger's wave equation, wave nature of an electron, significance of Eigen values and Eigen functions. Quantum numbers and their significance. Hybridisation of s,p,d and f orbitals and shapes of atomic orbitals. Rules for filling electrons in various orbitals, electronic configuration of the atoms (atomic no. up to 54) **10hrs**

Periodicity of elements : Introduction to modern periodic table, periodic properties such as effective atomic charge, screening effect, atomic and ionic radii, ionization energy, electron gain enthalpy, electronegativity and trends in groups and periods with respect to s and p block elements. Pauling, Allred-Rickhow scales, Mullikan Scales. Numerical problems are to be solved wherever applicable. **04 hrs**

UNIT-II: Fundamentals Of Organic Chemistry & Stereochemistry

Hybridization and Bond Formation : Hybridization, sigmaandpibonds, comparative study of bond lengths, bond angles, bond energies and dihedralangles,bond polarity,dipole moment. Delocalization and Electronic Effects: Electron displacement effects: inductive effect, electrometric effect, resonance effect, hyperconjugation, and steric effect-explanations with examples

Organic reaction Mechanism : Notations used to represent electron movements and directions of reactions-curly arrows. Types of bonds breaking- homolytic and heterolytic. Types of reagents- Electrophiles and nucleophiles. Nucleophilicity, basicity. Types of organic reactions- substitution, addition, elimination, rearrangement and pericyclic reactions, explanation with examples.

Reactive Intermediates : Structure, formation and stability and reactions of carbocations, carbanions, free radicals and carbenes **07 hrs**

Stereochemistry

Stereoisomerism : Definition of stereoisomerism, conformational isomers and configurational isomers (distinction between conformation and configuration). Newman, Sawhorse and Fischer projection formulae and their interconversions.

Geometrical isomerism : Definition, reason for geometrical isomerism, E and Z notation -CIP rules and examples, determination of configuration of geometric isomers by dipole moment method and anhydride formation method, syn and anti isomers in compounds containing C=N.

Optical isomerism : Chirality/asymmetry, enantiomerism, diastereomerism and meso compounds. R and S notations (compounds with two asymmetric centers), D and L configurations and *threoanderythrono*menclature, racemic mixture and racemization.

Resolution : Definition, Resolution of racemic mixture by: i) Mechanical separation ii) Formation of diastereomers iii) Biochemical methods. Biological significance of chirality. Problems are to be solved wherever applicable. **07hrs**

UNIT-III: Gases & Liquids

Gaseous state : Review of kinetic theory of gases, van der Waals equation of state. Boyle temperature.

Molecular velocity : Maxwell's Boltzmann distribution law of molecular velocities (most probable, average and root mean square velocities). Relation between RMS, average and most probable velocity and average kinetic energies (derivation not required), law of equipartition of energy.

Collision frequency, collision diameter, Collision cross-section, collision number and mean free path and coefficient of viscosity, calculation of σ and η, variation of viscosity with temperature and pressure.

Critical phenomena : Andrews's isotherms of CO_2, critical constants and their determination Relation between critical constants and van der Waals equation (Derivation), continuity of states, law of corresponding states. Numerical problems are to be solved wherever applicable. **07 hrs**

Liquid state : Molecular forces and general properties of liquids.

Surface tension : surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, determination of surface tension by capillary rise method, drop weight and drop number methods using stalagmometer. Effect of temperature on surface tension. Parachor, Additive and constitutive properties: atomic and structural parachor. Elucidation of structure of benzene and benzoquinone.

Viscosity : Definition, viscosity coefficient, fluidity, molecular viscosity, relative viscosity and absolute viscosity, determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature, size, weight, shape of molecules and intermolecular forces.

Refractive index : Definition, Specific and molar refraction. Determination of refractive index using Abbe's refractometer. Additive and constitutive properties: Elucidation of structure of molecules. Numerical problems are to be solved wherever applicable. **07hrs**

UNIT-IV : Analytical Chemistry

Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Accuracy, precision, selectivity and sensitivity. Method validation. Types and sources of errors in analytical measurements. Presentation of experimental data and results from the point of view of significant figures.

Titrimetric analysis : Principle, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/solutions using N1V1= N2V2, preparation of ppm level solutions from source materials (salts).

Acid-base titrimetry : Theory, titration curves for all types of acids – base titrations.

Redox titrimetry : Theory, balancing redox equations, titration curves, theory of redox indicators and applications.

Precipitation titrimetry : Theory, titration curves, indicators for precipitation titrations involving silver nitrate-Volhard's and Mohr's methods and their differences.

Complexometric titrimetry : Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water. Numerical problems are to be solved wherever applicable. **14 hrs**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 02 Marks	Q-II: 05 Marks	Q-III: 08 Marks	Total Marks
Unit I: Atomic Structure and Periodicity of Elements	14 h	2	2	2	30
Unit II: Fundamentals of Organic Chemistry & Stereochemistry	14 h	2	2	2	30
Unit III: Gases & Liquids	14 h	2	2	2	30
Unit IV: Analytical Chemistry	14 h	2	2	2	30
Total	56 h	8	8	8	-
				Total marks	**120**

Question paper pattern :

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1. a) 2 marks b) 5 marks c) 8 marks or
2. a) 2 marks b) 5 marks c) 8 marks

UNIT 2

3. a) 2 marks b) 5 marks c) 8 marks or
4. a) 2 marks b) 5 marks c) 8 marks

UNIT 3

5. a) 2 marks b) 5 marks c) 8 marks or 6. a) 2 marks b) 5 marks c) 8 marks

UNIT 4

7. a) 2 marks b) 5 marks c) 8 marks or 8. a) 2 marks b) 5 marks c) 8 marks

Note : The questions for unit-4 should be chosen from all the three units.

Reference Books

Inorganic Chemistry :

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P. L. Basic Inorganic Chemistry, 3 rd Ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J. J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Huheey, J. E., Keiter, E.A., Keiter, R. L. &Medhi, O. K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
5. Shriver, D.F. &Atkins, P.W. Inorganic Chemistry, Oxford University Press.
6. Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
7. Rodgers, G. E. Inorganic &Solid State Chemistry, Cengage Learning India Ltd., 2008.
8. Mark Weller and Fraser Armstrong, 5 th Edition, Oxford University Press (2011-2012) Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry. John Wiley & Sons, 1974.
9. G. L. Miessler& Donald A. Tarr: Inorganic Chemistry, Pearson Publication.
10. Mahan, B. H. University Chemistry 3rd Ed. Narosa (1998).
11. Petrucci, R. H. General Chemistry 5 th Ed. Macmillan Publishing Co., New York (1985).

Organic Chemistry:

1. Organic Chemistry- P. Y. Bruice, 7th Edition, Pearson Education Pvt. Ltd., New Delhi (2013).
2. Heterocyclic Chemistry- R. K. Bansal, 3rd Edition, New- Age International, New Delhi, 2004.
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7 th Ed. Cengage Learning India Edition, 2013.
4. Sykes, P. A. Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism- P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
7. Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
8. Graham Solomons, T. W., Fryhle, C. B. & Snyder, S. A. Organic Chemistry, John Wiley & Sons (2014).
9. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
10. Organic Chemistry- F. A. Carey, 4th Edition, McGraw Hill (2000).
11. Modern Organic Chemistry - R.O.C. Norman and D.J. Waddington, ELBS, 1983.
12. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
13. Organic Chemistry - L. Ferguson, Von Nostrand, 1985.
13. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
14. Organic Chemistry- Mehta and Mehta, PHI Learning Pvt. Ltd, New Delhi,2005.

Physical Chemistry :

1. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill, 2007.
2. Castellan, G.W. Physical Chemistry, 4th Ed. Narosa, 2004.
3. Kotz, J.C., Treichel, P. M. & Townsend, J. R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi, 2009.
4. P.W. Atkins: Physical Chemistry, 2002.
5. W.J. Moore: Physical Chemistry, 1972.
6. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
7. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
8. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
9. Physical Chemistry - Alberty R. A. and Silbey, R. J. John Wiley and sons, 1992.
10. Physical Chemistry - G. M. Barrow, McGraw Hill, 1986.
11. Physical Chemistry (3 rd Edition) - Gilbert W. Castilian, Narosa Publishing House, 1985.
12. Chemical Kinetics by K. J. Laidler, Tata McGraw Hill Publishing Co., New Delhi.
12. Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York, 1981.

Analytical Chemistry :

1. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R. C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
2. Willard, H. H., Merritt, L. L., Dean, J. & Settle, F. A. Instrumental Methods of Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Christian, G. D; Analytical Chemistry, VI Ed. John Wiley & Sons, New York, 2004.
4. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
5. Skoog, D. A. Holler F. J. & Nieman, T. A. Principles of Instrumental Analysis, Cengage Learning India Ed, 2017.
6. Ditts, R. V. Analytical Chemistry; Methods of Separation, van Nostrand, 1974.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- I Practical (NEP)
CHEMISTRY LAB DSCC-CHEM(P)-101

Teaching Hours : 52 **CIA Marks : 20**
Examination Hours : 3 **SEE Marks : 30**
Scheme (L:T:P) 0:0:4 **Credit : 2**

Course objectives : This course (CHEM-113-I) will enable the students to

1. Preparation of standard solution of different concentartions
2. Determination of the amount of inorganic substance present in the given solution
3. Estimation of organic compounds in the given solution

Course Outcome : After successfully completion of the course, student are able to;

DSCC-CHEM(P)-101.1. Adopt the principles of Volumetric Analysis in the determination of the amount of substance present in the given solution.

Mapping of CO with PO :

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
DSCC-CHEM(P)-101	2	2		3					1	2

Inorganic chemistry experiments:

1. Calibration of glasswares (burette, pipette, volumetric flask).
2. Determination of sodium carbonate using standard HCl solution (Standardize HCl solution using standard sodium carbonatesolution).
3. Determination of carbonate and bicarbonate present together ina mixture.
4. Determination of Mohr's salt and oxalic acid using standardized $KMnO_4$ solution.
5. Determination of ferrous (Fe (II)) and ferric (Fe(III)) ions in a solution using standard solution of K_2Cr2O_7 by internal indicator method (diphenylamine or Phenylanthranilic).
6. Determination of Cu (II) ions by iodometrically using $Na_2S_2O_3$.
7. Determination of Zinc/Magnesium using standard EDTA solution (Standardization of EDTA is to be carried out using standard zinc sulphatesolution).
8. Determination of iodine using sodium thiosulphate (Standardize the sodium thiosulphate usingdichromate).

Organic chemistry experiments:

1. Determination of phenol by bromination method
2. Determination of aniline by bromination method.
3. Determination of acetamide by hydrolysis method.
4. Determination of ethyl benzoate by hydrolysis method.
5. Determination of aspirin in the tablet by hydrolysis method.
6. Determination of glucose by Fehling's Solution

Standard solution is to be prepared by the students for both in regular and in practical examination.

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical Assessment	:	20 marks
Semester end practical examination	:	30 marks
Total:	**:**	**50 Marks**

Distribution of marks

Accuracy for main titration	:	08
Accuracy for Blank titration	:	06
Technique and presentation	:	04
Calculation	:	04
Practical record	:	04
Viva	:	04
Total	**:**	**30**

Reference Book :

1. Vogel's Textbook of Qualitative Chemical Analysis - J Bassett, R. C. Denney, G. H. Jeffery and J. Mendham, ELBS.
2. Practical Inorganic Chemistry - G. Marr and B. W. Rackett, Von Nostrand Reinhold.
3. Text Book of Practical Organic Chemistry – A.I.Vogel,
4. A Handbook of Organic Analysis – Clarke andHayes
5. Experiments in Physical chemistry - Shoemaker and Garland, McGraw Hill International edn
6. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co.Pvt.
7. N. S. Ganapragasamand G. Ramamurthy, Organic Chemistry – Lab manual, S.Viswanathan Co. Pvt.,
8. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry(Organic), S. Chand and Co.,

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- I-SEC (NEP)
Soil Analysis SEC-CHEM-1

Teaching Hours : 30 **CIA Marks : 20**
Examination Hours : 3 **SEE Marks : 30**
Scheme (L:T:P) 0:0:4 **Credit : 2**

Course objectives : This course (SEC-CHEM-1) will enable the students to

1. To develop basic understanding regarding soil testing in the students.
2. To introduce them with macro and micro nutrients for soil.
3. To acquire skills for Laboratory management and routine analysis of Soil

Course Outcome : After successfully completion of the course, student are able to;

SEC-CHEM-1.1. Discuss the basic components and factors affecting the fertility of soil
SEC-CHEM-1.2. Develop the skills of soil sampling
SEC-CHEM-1.3. Evaluate the physic-chemical and biological properties of soil

Mapping of CO with PO :

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
SEC-CHEM-1.1	2	1						1		
SEC-CHEM-1.2	2	1		2				2	1	1
SEC-CHEM-1.3	2	2	2	3	2		1	2	1	1

List of Experiments

1. Good Laboratory Practices/Data Entry/Record Book/SOP/MSDS.
2. Introduction to Soil analysis:
   a) Instructional hour : Definition of Soil, Concept of Lithosphere, Soil as a natural body, Soil Components : Air, Water, inorganic and organic solids, Formation of Soil, Types of Soils & Basic Concepts.
   b) Visit to Soil Testing Laboratory & Report writing. Visit to Farmers Fields for Collection of Soil Samples.
3. Physical properties of soil sample:
   a) Instructional hour: Soil Separates, Texture, Aggregation and Structure, Temperature, Color, Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration and Drainage, Compaction, Surface area, Soil water relationships.
   b) Determination of pH of soil sample using pH meter and determination of Electrical Conductivity of Soil Sample using Conductivity meter.
4. Chemical Properties of soil:
   a) Instructional hour: Chemical Properties of soil: Morphology of Colloids, Chemistry of Clays, Ionic Exchange, Acidity, Alkalinity, pH, Salinity, Reactions in Liming and Acidification
   b) Determination of alkalinity and salinity of the soil sample.
   c) Determination of Ca (II) and Mg(II) ions from soil sample
   d) Determination of Fe (II) and Fe (III) ions from soil sample.

5. Biological Properties of Soil:
   a) Instructional hour: Soil Organic Matter, C: N Relationships, N-Transformation, Soil Organisms, Sulfur Transformation.
   b) Determination of total organic matter in the given soil Sample.
6. Fertility of soil:
   a) Instructional hour: Soil deficiency with respect to macro and micro nutrient components, brief study of micronutrient & macronutrient sources & importance
   b) Determination of Na and K from soil sample by flame photometry.
7. Determination of pesticide residue in water and soil
8. Determination of Manganese in soil colorimetrically.
9. Determination of Sulphur in soil by turbidity method.

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical Assessment	:	20 marks
Semester end practical examination	:	30 marks
Total:	**:**	**50 Marks**

Distribution of marks

Accuracy for main titration	:	08
Accuracy for Blank titration	:	06
Technique and presentation	:	04
Calculation	:	04
Practical record	:	04
Viva	:	04
Total	**:**	**30**

References :

1. Laboratory manual for Environmental Chemistry: Sunita Hooda and Sumanjeet Kaur by S. Chand & Company 1999.
2. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
3. Fundamentals of soil science, Foth, H.D. Wiley Books.
4. Soil Science and Management, Plaster, Edward J., Delmar Publishers.
5. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York.
6. Handbook of Agricultural Sciences, S.S. Singh, P. Gupta, A. K. Gupta, Kalyani Publication.
7. Introduction to soil laboratory manual - J. J. Harsett Stipes.
8. Introduction to soil science laboratory manual, Palmer and Troch – Iowa State.
9. Analytical chemistry by H. Kaur.
10. Chemical Laboratory Safety and Security: A Guide to Developing Standard Operating Procedures. National Academies Press (2016). Board on Chemical Sciences and Technology, Division on Earth and Life Studies.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- I Theory (NEP)
CHEMISTRY IN DAILY LIFE OEC-CHEM-1

Teaching Hours : 42 **CIA Marks : 40**
Examination Hours : 3 **SEE Marks : 60**
Scheme (L:T:P) 0:0:3 **Credit : 3**

Course objectives : This course (OEC-CHEM-1) will enable the students to

1. On the role of chemistry in day- to- day life and to know more about the cosmetics and other chemicals that they use.
   a) of composition of milk and milk products and their analysis
   b) of food addives and adultration
   c) about different types and uses polymers and surface coating in day to day life

Course Outcomes: After successfully completion of the course, student are able to;

OEC-CHEM-1.1- List the chemical constituents of products used in daily life.
OEC-CHEM-1.2- Describe the biochemical constituents of dairy products and chemical constituents of polymers and surface coatings
OEC-CHEM-1.3- Discuss the role of food preservatives and food colorants.

Mapping of CO with PO :

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
OEC-CHEM-1.1	2		2						1	2
OEC-CHEM-1.2	2	2	1	2			2	2	3	2
OEC-CHEM-1.3	2	1		1			2	2	2	21

Unit- I

Household chemicals : Common chemicals used at home.

Cleansing agents : Preparation Chemical composition of Soaps, detergents, dish washers, drain cleaners, bleaching powder, Tooth paste, mouth wash and shampoo. Stain removers – Explanation with some common examples.

Domestic items : Safety matches, Wax candles, shoe polish, mosquito coils, household germicides and pesticides-their chemical composition.

Cosmetics – Contents and uses of Face powder, lipsticks. Sun protection lotions and creams, eye shadow and eyebrow pencils, antiperspirants, perfumes and deodorants-explanation with examples.Toxic household chemicals and their effects (antifreeze, bleach, drain cleaners, carpet cleaners, ammonia, air fresheners).

Soaps and detergents- Types of soaps, synthetic detergents (neutral, anionic and cationic), cleansing action of detergents. Advantages and disadvantages of detergents over soaps. **14hrs**

Unit- II

Dairy Products: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk. Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, determination of methyl alcohol in alcoholic beverages.

Food additives, adulterants, and contaminants- Food preservatives like benzoates, propionates, sorbates, disulphites.

Artificial sweeteners : Aspartame, saccharin, dulcin, sucralose, and sodium cyclamate.

Flavors: Vanillin, alkyl esters (fruit flavors), and monosodium glutamate.

Artificial food colorants : Coal tar dyes and non-permitted colors and metallic salts. Analysis of pesticide residues in food. **14hrs**

Unit- III

Polymers : Basic concept of polymers, classification and characteristics of polymers. Applications of polymers as plastics in electronic, automobile components, medical fields, and aerospace materials. Problems of plastic waste management. Strategies for the development of environment-friendly polymers.

Surface Coatings : Classification and brief introduction to surface coatings. Paints and pigments - formulation, composition and related properties. Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, (Plastic paint), Wax polishing, Water and Oil paints. **14hrs**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 02 Marks	Q-II: 05 Marks	Q-III: 08 Marks	Total Marks
Unit I: Household chemicals	14 h	4	2	3	42
Unit II: Dairy Products & Food additives	14 h	2	2	3	38
Unit III: Polymers & Surface Coatings	14 h	2	4	2	40
Total	42 h	8	8	8	-
				Total marks	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1. a) 2 marks b) 5 marks c) 8 marks or
2. a) 2 marks b) 5 marks c) 8 marks

UNIT 2

3. a) 2 marks b) 5 marks c) 8 marks or
4. a) 2 marks b) 5 marks c) 8 marks

UNIT 3

5. a) 2 marks b) 5 marks c) 8 marks or 6. a) 2 marks b) 5 marks c) 8 marks

UNIT 4

7. a) 2 marks b) 5 marks c) 8 marks or 8. a) 2 marks b) 5 marks c) 8 marks

Note: The questions for unit-4 should be chosen from all the three units.

References :

1. Hawley's Condensed Chemical Dictionary by Richard J. Lewis. Call Number: REF 540.3 H31.
2. Van Nostrand's Encyclopedia of Chemistry by Glenn D. Considine, Call Number: REF 540.3 V33C 2005.
3. Macmillan Encyclopedia of Chemistry by Joseph J. Lagowski.
4. NCERT 12th Standard Book and references therein.
5. Chemistry in Daily Life: Third Edition Paperback – 1 January 2012 by Singh K.
6. Chemistry at Home: Exploring the ingredients in everyday products- John Emsley, Royal Society of Chemistry (2015).
7. Chemistry in daily life - Kripal Singh, Third Edition, Eastern Academy Education, PHI Learning Pvt. Ltd, New Delhi(2012)

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- II Theory (NEP)
GENERAL CHEMISTRY-II DSCC-CHEM(T)-201

Teaching Hours : 56 **SEE Marks : 60**
Examination Hours : 3 **CIA Marks : 40**
Scheme (L:T:P) 4:0:0 **Credit : 4**

Course objectives : This course (DSCC-CHEM(T)-201) will enable the students to

1. Study bonding in inorganic molecules
2. Understand Chemistry of Aliphatic Hydrocarbons
3. Study properties of solids and kinetics of reactions
4. Understand the principles of gravimetric and water analysis

Course Outcomes : After successfully completion of the course, student are able to;

DSCC-CHEM(T)-201.1. Apply concepts of bonding and MOT to explain the properties of inorganic molecules
DSCC-CHEM(T)-201.2. Describe the methods of preparartion, properties and reactions of aliphatichydrocarbons
DSCC-CHEM(T)-201.3. Explain the kinetics of chemical reactionsand crystalline properties of solids
DSCC-CHEM(T)-201.4. Apply the analytical principles for water and inorganic salt anlaysis

Mapping of CO with PO :

CO	PO									
	1	2	3	4	5	6	7	8	9	10
DSCC-CHEM(T)-201.1	1	2								
DSCC-CHEM(T)-201.2		1								
DSCC-CHEM(T)-201.3	2	2								
DSCC-CHEM(T)-201.4	2	3						1	1	2 1

UNIT-I:Chemical Bonding & Molecular Structure

Ionic Bonding:

General characteristics of ionic compounds. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Born-Landé equation and calculation of lattice energy. Born-Haber cycle and its applications.

Polarizing power and polarizability:

Fajan's rules, ionic character in covalent compounds and percentage of ionic character.

Covalent bonding:

General characteristics of covalent compounds. VB approach, shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures of NO_3^-, CO_3 2- and SO_4 2- .

Molecular Orbital Theory:

LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules and ions of 1 st and 2 nd periods and heteronuclear diatomic molecules such as CO, NO and NO + . Comparison of VB and MO approaches. Numerical problems are to be solved wherever applicable **14 hrs**

UNIT-II: Chemistry of Aliphatic Hydrocarbons

Alkanes : Methods of p reparation by catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis and from Grignard reagent. Free radical mechanism of halogenations, relative reactivity and selectivity of halogenation. Conformational analysis of ethane and butane.

Alkenes: Methods of preparation by dehydration of alcohols and dehydrohalogenation of alkyl halides. Mechanism of E1, E2, E1cb reactions.Saytzeff and Hofmann eliminations. cis Alkenes by partial catalytic hydrogenation and trans alkenes by Birch reduction. Reactions: Addition of HX (Markownikov's and anti-Markownikov's addition) Stereospecificity of halogen addition, regioselectivity and relative rates of addition reaction. Hydrogenation, hydration, hydroxylation and epoxidation of alkenes. Oxidative cleavage of alkenes with KMnO4. Ozonolysis, mechanism of ozonolysis in propene and polymerization.

Alkadienes : Classification, mechanism of addition of halogen and hydrogen halides in 1,3- diene, kinetically and thermodynamically controlled addition of HBr to 1,3-butadiene, polymerization and Diels-Alder reaction.

Alkynes : Preparation: Acetylene from CaC_2 and conversion into higher alkynes by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions : Acidity of 1-alkynes and formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alk. $KMnO_4$. **11 hrs**

Cycloalkanes : Types of cycloalkanes and their relative stability. Baeyer strain theory and theory of strainless rings. Conformational analysis of cyclohexane with Karplus energy diagram. Axial and equatorial bonds. Relative stability of mono substituted cyclohexanes. **03 hrs**

UNIT-III: Solids & Chemical Kinetics

Solids :

Types of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl. Defects in crystals.

Liquid Crystals:

Explanation, classification with examples- Smetic, nematic, cholesteric, disc shaped and polymeric. Structures of nematic and cholesteric phases-molecular arrangements in nematic and cholesteric liquid crystals. Applications of liquid crystals in LCDs and thermal sensing. Numerical problems are to be solved wherever applicable. **07 hrs**

Chemical Kinetics :

Review of reaction rates, order and molecularity. Factors affecting rates of reaction: concentration pressure, temperature, catalyst, etc. Examples for different orders of reactions. Derivation of integrated rate equations for zero and second order reactions (both for equal and unequal concentrations of reactants). Half– life of a reaction (numerical problems). Methods for determination of order of a reaction by half life period and differential equation method. Effect of temperature on reaction rates, temperature coefficient, Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Numerical problems are to be solved wherever required. **07 hrs**

UNIT-IV: Analytical Chemistry

Gravimetric Analysis :

Requisites of precipitation, mechanism of precipitation, factors influencing precipitation, coprecipitation and post-precipitation. Structure, specificity, conditions and applications of organic reagents such as salcylaldoxime, oxine, DMG, cupron and cupferron in inorganic analysis. Advantages of organic reagents over inorganic reagents. **06 hrs**

Water analysis :

Water availability, requirement of water. Quality of surface water and ground water. Impurities in water. Standards of water quality (color, pH, hardness, TDS, sulphate, fluoride, chloride etc.) for potable, domestic, industrial and agricultural purpose. Water treatment technologies – house hold water treatment, municipal water treatment, industrial treatment (primary and secondary treatment of industrial effluent). Softening of water. Disinfection of water. Definition and determinations of DO, BOD and COD, and their significance. Numerical problems are to be solved wherever required. **08 hrs**

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 02 Marks	Q-II: 05 Marks	Q-III: 08 Marks	Total Marks
Unit I: Chemical Bonding & Molecular Structure	14 h	2	2	2	30
Unit II: Fundamentals Of Organic Chemistry & Stereochemistry	14 h	2	2	2	30
Unit III: Solids & Chemical Kinetics	14 h	2	2	2	30
Unit IV: Analytical Chemistry	14 h	2	2	2	30
Total	56 h	8	8	8	-
				Total marks	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks: 60**

Instructions:. Answer any four questions.

UNIT 1

1. a) 2 marks b) 5 marks c) 8 marks or
2. a) 2 marks b) 5 marks c) 8 marks

UNIT 2

3. a) 2 marks b) 5 marks c) 8 marks or
4. a) 2 marks b) 5 marks c) 8 marks

UNIT 3

5. a) 2 marks b) 5 marks c) 8 marks or 6. a) 2 marks b) 5 marks c) 8 marks

UNIT 4

7. a) 2 marks b) 5 marks c) 8 marks or 8. a) 2 marks b) 5 marks c) 8 marks

Note: The questions for unit-4 should be chosen from all the three units.

References

Inorganic Chemistry:

1. Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F. A., Wilkinson, G. &Gaus, P. L. Basic Inorganic Chemistry, 3rd Ed., Wiley.
3. Douglas, B. E., McDaniel, D. H. & Alexander, J. J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Huheey, J. E., Keiter, E.A., Keiter, R.L. &Medhi, O. K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
5. Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
6. Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
7. Rodgers, G. E. Inorganic &Solid State Chemistry, Cengage Learning India Ltd., 2008.
8. Mark Weller and Fraser Armstrong, 5 th Edition, Oxford University Press (2011-2012) Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry. John Wiley & Sons, 1974.
9. G. L. Miessler& Donald A. Tarr: Inorganic Chemistry, Pearson Publication.
10. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
11. Petrucci, R.H. General Chemistry 5 th Ed. Macmillan Publishing Co., New York (1985).

Organic Chemistry:

1. Organic Chemistry-P. Y. Bruice, 7th Edition, Pearson Education Pvt. Ltd., New Delhi (2013).
2. Heterocyclic Chemistry- R. K. Bansal, 3rd Edition, New- Age International, New Delhi, 2004.
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7 th Ed. Cengage Learning India Edition, 2013.
4. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
7. Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
8. Graham Solomons, T. W., Fryhle, C. B. & Snyder, S.A. Organic Chemistry, John Wiley &Sons (2014).
9. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- II Practical (NEP)
CHEMISTRY LAB: -II DSCC-CHEM(P)-201

Teaching Hours : 52 **CIA Marks : 20**
Examination Hours : 3 **SEE Marks : 30**
Scheme (L:T:P) 0:0:4 **Credit : 2**

Course objectives: This course (CHEM-113-I) will enable the students to

1. Analyze errors in the analysis
2. Apply analytical techniques to water analysis and other analysis

Course Outcome: After successfully completion of the course, student are able to;

DSCC-CHEM(P)-201.1. Evaluate the physico-chemical properties of liquids

Mapping of CO with PO :

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
DSCC-CHEM(P)-201.1	2	3	1	2	1	1	1	1	1	1

Analytical chemistry experiments

Explanation regarding errors, types of errors, accuracy, precision, significant figures and standard deviation (students should write in the journal regarding the above).

1. Determination of total alkalinity in antacids.
2. Determination of Vitamin C in lemon juice/formulations.
3. Determination of free alkali present in differentsoaps/detergents.
4. Analysis of DO in waste water sample / pond water / river water etc.
5. Determination of Ni (II) using DMG by gravimetric method.
6. Determination of Chemical Oxygen Demand (COD) in waste water sample.
7. Determination of temporary, permanent and total hardness of water using standard EDTA solution.
8. Determination of Manganese from pyrolusite ore volumetrically. (Added)

Physical chemistry experiments

1. Determination of surface tension and parachor of alcohol series.
2. Determination of surface tension of soap solutions for various concentrations.
3. Determination of the viscosity of liquids (ethylacetate& ethyl alcohol /toluene, & chlorobenzene or any other two non hazardous liquids) using Ostwald's viscometer.
4. Study of the variation of viscosity of sucrose solution with different concentrations.
5. Determination of specific and molar refraction by Abbes refractometer (ethyl acetate, methyl acetate, ethylene chloride)
6. Determination of the composition of liquid mixture by refractometry (toluene & alcohol, water & sucrose solution).

Scheme of Evaluation

Distribution of marks

Chemistry practical examination consists of two parts

Continuous internal practical Assessment	:	20 marks
Semester end practical examination	:	30 marks
Total:	**:**	**50 Marks**

Distribution of marks

Accuracy for main titration	:	08
Accuracy for Blank titration	:	06
Technique and presentation	:	04
Calculation	:	04
Practical record	:	04
Viva	:	04
Total	**:**	**30**

Reference Books :

1. Barrow, G. M. Physical Chemistry, Tata McGraw-Hill, 2007.
2. Castellan, G. W. Physical Chemistry, 4th Ed. Narosa, 2004.
3. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
4. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
5. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
6. Physical Chemistry - Alberty R. A. and Silbey, R. J. John Wiley and sons, 1992.
7. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
8. Willard, H. H., Merritt, L. L., Dean, J. & Settle, F. A. Instrumental Methods of Analysis, 7 th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
9. Christian, G. D; Analytical Chemistry, VI Ed. John Wiley & Sons, New York, 2004.
10. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
11. Skoog, D. A. Holler F. J. & Nieman, T. A. Principles of Instrumental Analysis, Cengage Learning India Ed, 2017. Ditts, R.V. Analytical Chemistry; Methods of Separation, van Nostrand, 1974.

DEPARTMENT OF CHEMISTRY (U. G.)
SYLLABUS
Semester- II Theory (NEP)
Molecules Of Life OEC-CHEM-2

Teaching Hours : 42 **CIA Marks : 40**
Examination Hours : 3 **SEE Marks : 60**
Scheme (L:T:P) 3:0:0 **Credit : 2**

Course objectives : This course (OEC-CHEM-2) will enable the students to

1. Understand Biological importance of carbohydrates.
2. Explain Structure of protein – qualitative idea about primary, secondary, tertiary, and quaternary structures.
3. Identify Biological roles of DNA and RNA: Replication, Transcription and Translation
4. Classify with examples, functions and deficiency diseases of hormones.

Course Outcomes : After successfully completion of the course, student are able to;

OEC-CHEM-2.1- Differentiate types of sugars and their chemical structures.
OEC-CHEM-2.2- Outline the structure of different types of amino acids and peptides.
OEC-CHEM-2.3- Examine the Chemical nature and properties of oils and fats.

Mapping of CO with PO :

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
OEC-CHEM-2.1	2		3							1
OEC-CHEM-2.2	2		3							1
OEC-CHEM-2.3	3		3				1			2

UNIT I :

Carbohydrates :

Sugars, non sugars, reducing and non-reducing sugars. Occurrence and general properties of glucose and fructose. Open chain and Haworth ring structures of glucose and fructose. Epimers, mutarotation and anomers. Disaccaharides: Occurance of disaacharides (Sucrose, Maltose and Lactose). Glycosidic linkage in disaccharides. Ring structures of sucrose, maltose and lactose. Polysaccharides: Starch – monomer units, glycosidic linkage, components-difference in their structure (explanation only) and solubility in water. Cellulose and glycogen– monosaccharide, glycosidic linkage, structure (explanation only). Biological importance of carbohydrates.

Amino Acids, Peptides and Proteins :

a-amino acids , general formula, zwitter ion form of a-amino acid, general formula. Isoelectric point and its importance. Classification of amino acids as essential and nonessential- examples. Configuration of optically active a-amino acids (found in proteins). Peptide bond. Proteins: classification based molecular shape –fibrous and globular, examples. Structure of protein – qualitative idea about primary, secondary, tertiary, and quaternary structures (diagrams not required). Denaturation of protein. **14 hrs**

UNIT II :

Oils and fats Biological Importance of oils and fats. Fatty acids (saturated, unsaturated fatty acids, formation of triglycerides and general formula of triglycerides. Chemical nature of oils and fats-saponification, acid hydrolysis, rancidity and its prevention methods, refining of oils, hydrogenation of oils, drying of oils. Iodine value. Introduction to lipids, classification. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).

Nucleic Acids :

Components of nucleic acids: Adenine, guanine, thymine and cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (nomenclature), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation. **14 hrs**

UNIT III :

Vitamins and Hormones :

Classification and biological significance, source and structure of Vitamin A, B1 (thiamine), B2 (riboflavin), B6 (pyridoxine), ?- tocopherol, K1 (phylloquinone), C (ascorbic acid). Deficiency diseases of vitamins. Hormones: definition, classification with examples, functions and deficiency diseases of hormones.

Concept of Energy in Biosystems:

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of food materials (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.

14 hrs

Blue print of paper setting

Units	No.of Teaching hours	Q-I: 02 Marks	Q-II: 05 Marks	Q-III: 08 Marks	Total Marks
Unit I: Carbohydrates:	14h	4	2	3	42
Unit II: Oils and fats, Nucleic Acids :	14h	2	2	3	38
Unit III: Vitamins and Hormones:	14h	2	4	2	40
Total	42h	8	8	8	-
				Total marks	**120**

Question paper pattern:

Time: 2 hours 30 min **Max Marks : 60**

Instructions:. Answer any four questions.

UNIT 1

1. a) 2 marks b) 5 marks c) 8 marks or
2. a) 2 marks b) 5 marks c) 8 marks

UNIT 2

3. a) 2 marks b) 5 marks c) 8 marks or
4. a) 2 marks b) 5 marks c) 8 marks

UNIT 3

5. a) 2 marks b) 5 marks c) 8 marks or
6. a) 2 marks b) 5 marks c) 8 marks

UNIT 4

7. a) 2 marks b) 5 marks c) 8 marks or 8. a) 2 marks b) 5 marks c) 8 marks

Note: The questions for unit-4 should be chosen from all the three units.

References :

1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed.,
5. W. H. Freeman. Berg, J. M., Tymoczko, J. L. &Stryer, L. Biochemistry, 2002.

DEPARTMENT OF MATHEMATICS

Semester V (CBCS)

Linear Algebra and Numerical Methods-I DSE-MATH-505 (A) -T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 03 **SEE : 70**
Scheme (L:T:P) 4:0:0 **Credits : 04**

Course Objectives : The course will enable the students to

1. Explain concepts of vector spaces, subspaces, bases, dimension and their properties
2. Identify the linear transformations, Matrix of linear transformations and discuss the kernel and range of a linear transformation in terms of nullity and rank of the matrix.
3. Understand the basic concepts of Δ, E, ∇ and Simplify problems using Newton forward formula and Newton backward method.

Course Outcome : Students will able to

DSE-MATH-505 (A) –T.1: Illustrate the concepts of vector spaces, subspaces, bases, dimension and their properties.

DSE-MATH-505 (A) –T.2: Relate matrices and linear transformations; compute Eigen values and Eigen vectors of linear transformations.

DSE-MATH-505 (A) –T.3: Identify Basic concepts of operators Δ, E, ∇ and Simplify problems using Newton forward formula and Newton backward method.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-505 (A) –T.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-505 (A) –T.2	2	1	-	1	2	-	-	-	-	-	1	1	1
DSE-MATH-505 (A) –T.3	2	1	-	1	1	-	-	-	-	-	1	2	1

Course content :

Unit-I: Vector Spaces **(25 Hrs)**

Vector Spaces – Introduction – Examples – Vector subspaces – Criterion for a subset to be a subspace – Algebra of Subspaces – Linear Combination – Linear Span – Linear dependence and linear Independence of vectors – Theorems on linear dependence and linear independence – Basis of a vector space – Dimension of a vector space — Some properties – Quotient spaces - Homomorphism of vector spaces– Isomorphism of vector spaces – Direct Sums

Unit-II: Linear Transformations **(20 hrs)**

Linear transformation – Linear maps as matrices – Change of basis and effect of associated matrices – Kernel and image of a linear transformation - Rank and nullity theorem – Eigen values and Eigen vectors of a linear transformation.

Unit III: Numerical Methods-I **(15Hrs)**

Finite Differences: Definition and properties of, Ñ E & ? relations, among them. The nth difference of a polynomial, Separation of operators, Newton – Gregory's forward and backward differences, Interpolation formulae. Lagrange's interpolation formula.

Teaching pedagogy:

Chalk and talk

Blue print : B.Sc V Semester Scheme/Blue prints for paper setting Max. Marks 70

Sl. No.	Name of the Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	10 Marks
1.	Vector Spaces25	39	03	03	02	
2.	Linear Transformations	20	37	02	03	02
3.	Numerical Methods-I	15	24	02	02	01
	Total	**60**	**104**	**07**	**08**	**05**

B. Sc. V. SEMESTER
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.

I.	Define/Solve any FIVE of the following (Out of 7)	5 X 2 = 10
II.	Solve any SIX of the following (Out of 8)	6 X 5 = 30
III.	Solve any THREE of the following (Out of 5)	3 X10 = 30

Reference Books :

1. I. N. Herstien – Topics in Algebra.
2. Elements of Real Analysis-Shantinarayan and M. D. Raisinghania
3. Modern Algebra - A. R. Vasishtha
4. Modern algebra- Surjeeth singh & Quazi zamaruddin
5. Introductary methods of Numerical Analysis – S. S. Shastry.
6. College Mathematics series I & II – N. Rudraiah & Others
7. Numerical methods for Sc. & Eng. – M. K. Jain
8. Finite differences and Numerical Analysis – H.C.Saxena

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
Linear Algebra and Numerical Methods-I DSE-MATH-505(A) -P

Teaching Hours : 03 **CIA Marks : 15**
Examination Hours : 03 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Identify concepts of linear combination, linear independence and dependence, spans, basis, dimension using maxima
2. Evaluate a Newton-Gregory interpolation using Scilab.

Course Outcome : Students will able to

DSE-MATH-505(A)–P.1: Illustrate the concept of linear combination, linear independence and dependence, spans, basis, dimension using maxima commands .

DSE-MATH-505(A)–P.2: Explain concepts of Newton-Gregory Interpolation and Lagrange Interpolation using Scilab.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-505(A)–P.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-505(A)–P.2	2	1	-	1	2	-	-	-	-	-	1	1	1

Course content :

List of Programs :

1. Expressing a vector as a linear combination of given set of vectors.
2. Examples on linear independent vectors.
3. Examples on linear dependent vectors.
4. Basis and dimension
5. Find the linear transformation of a matrix.
6. Verifying whether a given transformation is Linear
7. Find the matrix of linear transformation $T:R^2 \rightarrow R^2$ defined by $T(x, y)=(2x+3y, 4x-5y)$ with respect to the standard basis.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
4. Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
Advance Algebra and Integral Calculus-I DSE-MATH-505 (B) -T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 03 **SEE : 70**
Scheme (L:T:P) 4:0:0 **Credits : 04**

Course Objectives : The course will enable the students to

1. Apply the Characteristic polynomials, Diagonalizability, Invariant subspaces, Cayley-Hamilton theorem.
2. To offer a gentle introduction to the concepts of Laplace transforms and inverse Laplace transforms.
3. Solve Definition of multiple integrals – its conversion to iterated integrals

Course Outcome: Students will able to

DSE-MATH-505 (B) –T.1: Use matrix algebra and the related to matrix to linear transformation.
DSE-MATH-505 (B) –T.2: Understand the applications of the Laplace transforms.
DSE-MATH-505 (B) –T.3: Evaluate the volume of solids using cross sections.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-505 (B) –T.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-505 (B) –T.2	2	1	-	1	2	-	-	-	-	-	1	1	1
DSE-MATH-505 (B) –T.3	2	1	-	1	1	-	-	-	-	-	1	2	1

Course content :

Unit I: Advance Algebra **25Hrs**

Algebra of Linear transformations, Minimal polynomials, Regular and singular transformation, Range and rank of a transformation and its properties, characteristic roots and characteristic vectors. The matrix representation of a linear transformation, Composition of a linear transformation and matrix multiplication, The change of coordinate matrix, transition matrix, The dual space. Characteristic polynomials, Diagonalizability, Invariant subspaces, Cayley-Hamilton theorem.

Unit II: Laplace Transforms **-20 Hrs**

Laplace transforms: Basic properties, Laplace Transforms of some common function, periodic functions, Derivatives and Integral of a function. Heaviside function and Dirac – delta function, Convolution theorem. Inverse Laplace transforms. Laplace Method of solving ordinary differential equations of first and second order with constant coefficients.

Unit III: Integral calculus-I **- 15Hrs**

Definition of multiple integrals – its conversion to iterated integrals. Evaluation of double integrals by change of order of integration and by change of variables – computation of plane and surface area, volume underneath a surface and volume of revolution using double integrals. Definition of triple integral and evaluation – change of variables – volume as a triple integral.

Teaching pedagogy :

Chalk and talk

B.Sc V Semester Scheme/Blue print for paper setting DSE-MATH-505(b) Max. Marks 70

Blue print : B.Sc V Semester Scheme/Blue prints for paper setting Max. Marks 70

Sl. No.	Name of the Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	10 Marks
1.	Advance Algebra	25	39	03	03	02
2.	Laplace Transforms	20	37	02	03	02
3.	Integral Calculus-I	15	24	02	02	01
	Total	**60**	**104**	**07**	**08**	**05**

B. Sc V SEMESTER
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.

I. Define/Solve any FIVE of the following (Out of 7) 5 X 2 = 10
II. Solve any SIX of the following (Out of 8) 6 X 5 = 30
III. Solve any THREE of the following (Out of 5) 3 X10 = 30

Reference Books :

1. Laplace Transformation Theory – M. G. Smith
2. College Mathematics for B.Sc. Series I & II – N. Rudraiah & Others
3. Text book of B.Sc. Mathematics – G. K. Ranganath & Others
4. Topics in Algebra - N. Herstein
5. Linear Algebra -S. Freidberg. A Insel, and L Spence
6. Linear Algebra and Matrix theory - J. Gilbert and L. Gilbert
7. Integral Calculus - Shantinarayan

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
Advance Algebra and Integral Calculus-I DSE-MATH-505(B) - P

Teaching Hours : 03 **CIA Marks : 15**
Examination Hours : 03 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Obtain the equation for surfaces and plot the curves in three dimensions.

Course Outcome: Students will able to

DSE-MATH-505(B) – P.1 : Analyze the vectors in R^n geometrically and algebraically.
DSE-MATH-505(B) – P.2: Find Laplace and inverse Laplace transforms of some standard functions using maxima and scilab.

Course content :

List of Programs :

1. Finding the Laplace transforms of some standard functions.
2. Finding the inverse Laplace transform of simple functions.
3. Implementing Laplace transform method of solving ordinary linear differential equations of first and second order with constant coefficient
4. Evaluation of the line integral with constant limits.
5. Evaluation of the double integral with constant limits.
6. Evaluation of the triple integral with constant limits.
7. Evaluation of the line integral with variable limits.
8. Evaluation of the double integral with variable limits.
9. Evaluation of the triple integral with variable limits.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
4. Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
SEC 3.1: Probability and Statistics SEC-MATH-505(A)-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours: 011/2 **SEE : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course Objectives: The course will enable the students to

1. Understand the addition principle and multiplication principle of probability.
2. Understand the concept of mean, variance of single random variable.

Course Outcome: Students will able to

SEC-MATH-505(A)-T.1: Discuss the concept of sample space, probability axioms and real random variable.
SEC-MATH-505(A)-T.2: Differentiate the concept of probability mass functions and probability density functions.
SEC-MATH-505(A)-T.3: Identify and characterize different distribution curves.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-505(A)-T.1	1	1	-	2	2	-	-	-	-	-	2	2	1
SEC-MATH-505(A)-T.2	2	1	-	1	2	-	-	-	-	-	1	1	1
SEC-MATH-505(A)-T.3	1	1	-	2	2	-	-	-	-	-	2	2	1

Course content :

Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, discrete distributions: uniform, binomial, Poisson, continuous distributions: uniform, normal, exponential. Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables.

Teaching pedagogy :

Chalk and talk

B. Sc V SEMESTER
MODEL QUESTION PAPER (THEORY)
SEC- Model Question Paper

Time: 90 min **Max. Marks: 35**

Instructions: Answer all the questions.

Q I. Define/Solve any FIVE of the following (Out of 7) 5x2=10
Q II. Solve any THREE of the following (Out of 5) 3x5=15
Q III. Solve any ONE of the following (Out of 2) 1x10=10

Reference Books :

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia, 2007.
2. Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Application, 7th Ed., Pearson Education, Asia, 2006.
3. Sheldon Ross, Introduction to Probability Model, 9th Ed., Academic Press, Indian Reprint, 2007.

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
SEC 3.1: Probability and Statistics SEC-MATH-505(A)- P

Teaching Hours : 02 **CIA Marks : 15**
Examination Hours : 02 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Understand the construction of probability distribution table for discrete random variable
2. Understand the compilation of programs for binomial distribution.

Course Outcome : Students will able to

SEC-MATH-505(A)- P.1: Design a scilab program to calculate the fundamental laws of probability such as addition principle and Multiplication principle.
SEC-MATH-505(A)- P.2: Construct a probability distribution table for single random variable using Scilab program.
SEC-MATH-505(A)- P.3: Create a Scilab program to Evaluate mean, variance of discrete random variable.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-505(A)- P.1	1	1	-	2	2	-	-	-	-	-	2	2	1
SEC-MATH-505(A)- P.2	2	1	-	1	2	-	-	-	-	-	1	1	1
SEC-MATH-505(A)- P.3	1	1	-	2	2	-	-	-	-	-	2	2	1

Course content :

List of Programs :

1. Sample space and events
2. Finite probability spaces
3. Equiprobable spaces
4. Addition principle
5. Conditional probability
6. Probability distribution of a random variable
7. Expectation of a random variable
8. Variance and standard deviation of a random variable
9. Binomial disrtribution

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
4. Scilab (A free software to Matlab) : H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
SEC 3.2: Mathematical Finance SEC-MATH-505(B) -T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 011/2 **SEE : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course Objectives : The course will enable the students to

1. Demonstrate the understanding of concept relating to function and annuities.
2. Create and evaluate floating- rate bonds immunization asset return, short selling, portfolio return, random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model.

Course Outcome : Students will able to

SEC-MATH-505(B) –T.1 : Understanding how to construct the best investment strategies that minimizes real world.

SEC-MATH-505(B) –T.2: Evaluate arbitrage and risk aversion, Interest time value of money, inflation, net present value, internal rate of return.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-505(B) –T.1	2	1	-	1	-	-	-	-	-	-	2	1	1
SEC-MATH-505(B) –T.2	1	1	-	2	-	-	-	-	-	-	2	1	1

Course content :

Basic principles : Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous), time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), comparison of NPV and IRR. Bonds, bond prices and yields. Floating-rate bonds, immunization. Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance and correlation), random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model (review of Lagrange multipliers for 1 and 2 constraints).

Teaching pedagogy :

Chalk and talk

B. Sc V SEMESTER
MODEL QUESTION PAPER (THEORY)
SEC- Model Question Paper

Time: 90 min **Max. Marks: 35**

Instructions: Answer all the questions.

Q I. Define/Solve any FIVE of the following (Out of 7) 5x2=10
Q II. Solve any THREE of the following (Out of 5) 3x5=15
Q III. Solve any ONE of the following (Out of 2) 1x10=10

Reference Books :

1. David G. Luenberger, Investment Science, Oxford University Press, Delhi, 1998.
2. John C. Hull, Options, Futures and Other Derivatives, 6th Ed., Prentice-Hall India, Indian reprint, 2006.
3. Sheldon Ross, An Elementary Introduction to Mathematical Finance, 2nd Ed., Cambridge University Press, USA, 2003.

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
SEC 3.2: Mathematical Finance SEC-MATH-505(B) - P

Teaching Hours : 02 **CIA Marks : 15**
Examination Hours :02 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Demonstrate the understanding of concept relating to function and annuities.
2. Create and evaluate floating- rate bonds immunization asset return, short selling, portfolio return , random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model.

Course Outcome : Students will able to

SEC-MATH-505(B) – P.1: Evaluate arbitrage and risk aversion, Interest time value of money, inflation, net present value, internal rate of return.

SEC-MATH-505(B) – P.2: Understanding how to construct the best investment strategies that minimizes real world

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-505(B) – P.1	1	1	-	2	2	-	-	-	-	-	1	1	2
SEC-MATH-505(B) – P.2	2	1	-	1	2	-	-	-	-	-	1	1	1

Course content :

List of Programs :

1. Write a scilab program to determine the current bond price.
2. Write a scilab program to determine the duration of the portfolio.
3. Write a scilab program to determine the expected return and standard deviation of an equally weighted portfolio of the three asserts.
4. Write a program in scilab that gives a plot for future value of deposite through simple and compound interest.
5. Determine the future value of a deposit both simple and compound interest using input built in function in scilab program.
6. Write a simple program to compute simple interest using built-in-function input.
7. Write a scilab code to calculate net present value.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
SEC 3.3: Mathematical Modelling SEC-MATH-505(C)-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 01 1/2 **SEE : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course Objectives : The course will enable the students to

1. Demonstrate the use of critical thinking and problem solving skills in the applications of differential equation.
2. Conduct a creative and innovative solutions to mechanics of simultaneous differential equation and its application

Course Outcome : Students will able to

SEC-MATH-505(C)-T.1: Explain the applications of differential equations like the vibrations of a mass on a spring, mixture problem, free damped motion, forced motion etc

SEC-MATH-505(C)-T.2: Demonstrate mechanics of simultaneous differential equation and its application to traffic flow, vibrating spring, vibrating membrane and some others.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-505(C)-T.1	2	1	-	1	-	-	-	-	-	-	2	1	1
SEC-MATH-505(C)-T.2	1	1	-	2	-	-	-	-	-	-	2	1	1

Course content :

Applications of differential equations: the vibrations of a mass on a spring, mixture problem, free damped motion, forced motion, resonance phenomena, electric circuit problem, Mechanics of simultaneous differential equations. Applications to Traffic Flow. Vibrating string, vibrating membrane, conduction of heat in solids, gravitational potential, conservation laws.

Teaching pedagogy :

Chalk and talk

B. Sc V SEMESTER
MODEL QUESTION PAPER (THEORY)
SEC- Model Question Paper

Time: 90 min **Max. Marks: 35**

Instructions: Answer all the questions.

Q I. Define/Solve any FIVE of the following (Out of 7)	5x2=10
Q II. Solve any THREE of the following (Out of 5)	3x5=15
Q III. Solve any ONE of the following (Out of 2)	1x10=10

Reference Books :

1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.

DEPARTMENT OF MATHEMATICS
Semester V (CBCS)
SEC 3.3: Mathematical Modeling SEC-MATH-505(C) - P

Teaching Hours : 02 **CIA Marks : 15**
Examination Hours : 02 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Demonstrate differential equation using Maxima command.
2. Evaluate natural frequency of torsional pendulum, mass in a spring mass system, spring mass system with coulomb damping using scilab program.

Course Outcome : Students will able to

SEC-MATH-505(C) – P.1 : Apply scilab program on damped oscillatory, electric circuit.
SEC-MATH-505(C) – P.2: Construct the graph of Damped Linear Oscillator, position, velocity an acceleration corresponding to given parameter: m=1kg, β =0.1 and k=0.5N/M. Determine constants A_0 and ϕ in damped oscillatory motion.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-505(C) – P.1	1	1	-	2	1	-	-	-	-	2	1	2	1
SEC-MATH-505(C) – P.2	2	1	-	1	2	-	-	-	-	1	2	1	1

Course content :

List of Programs :

1. Solve $x^2y - \left(\frac{d^2y}{dx^2}\right) = xy^2 + x^3 - 1$ with x=1 and y=1.
2. Solve the given differential equation $\left(\frac{dx}{dt}\right)^2 + 5x^2 = 8$ using Maxima command.
3. Plot the graph of Damped Linear Oscillator.
4. Write a Scilab program on natural frequency of torsional pendulum.
5. Write a Scilab program on mass in a spring mass system.
6. Write a Scilab program on spring mass system with coulomb damping.
7. Plot the graph of position, velocity an acceleration corresponding to given parameter: m=1kg, β =0.1 and k=0.5N/M. Determine constants A_0 and ϕ in damped oscillatory motion.
8. Programs on damped oscillatory
9. Scilab programs on electric circuit

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
Complex analysis and Numerical methods-II DSE-MATH-606 (A)-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 03 **SEE : 70**
Scheme (L:T:P) 4:0:0 **Credits : 04**

Course Objectives : The course will enable the students to

1. Describe basic properties of complex functions, Analytic functions and Cauchy's Riemann equations. Apply Cauchy Residue Theorem, Milene-Thomson Method and Cauchy's Integral theorem to integrate the given complex function.
2. Examine the Numerical solutions of algebraic and transcendental equations.

Course Outcome : Students will able to

DSE-MATH-606 (A)-T.1 - Describe basic properties of complex functions and having the ability to compute such functions.

DSE-MATH-606 (A)-T.2: Solve numerical solutions of non-homogeneous system of linear equations in three variables using Jacobi's method and Gauss Seidal method.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-606 (A)-T.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-606 (A)-T.2	2	1	-	1	2	-	-	-	-	-	1	1	1

Course content :

Unit I: Complex analysis **- 42 Hrs**

Functions of a complex variable-limit, continuity and differentiability of a complex function. Analytic function Cauchy Riemann equations in Cartesian and Polar forms-Sufficiency conditions for analyticity (Cartesian form only)-Harmonic function-standard properties of analytic functions-construction of analytic function when real or imaginary part is given. Milne-Thomson method, Complex integration-the complex integration–properties-problems. Cauchy's Integral theorem-proof using Green's theorem-direct consequences. Cauchy's Integral formula with proof-Cauchy's generalised formula for the derivatives.

Applications for evaluation of simple line integrals - Cauchy's inequality with proof – Liouville's theorem with proof. Fundamental theorem of algebra with proof. Transformations – conformal transformation – some elementary transformations namely Translation, rotation, magnification and inversion - examples. The bilinear transformation (B.T.)-cross ratio-invariant points of a B.T.-properties- (i) B.T. sets up a one to one correspondence between the extended z-plane and the extended w-plane. (ii) Preservation of cross ratio under a B.T. (iii) A B.T. transforms circles onto circles or straight lines.

Problems on finding a B. T., and finding images under a B. T. and invariant points of a B. T. Discussion of transformations $w = z^2$, w =sin?z , w =cosh?z and $w = e^z$.

Unit-II: Numerical Methods II **-18 Hrs**

Numerical solutions of algebraic and Transcendental equations – method of successive bisection - method of false position – Newton-Raphson method. Numerical solutions of non-Homogeneous system of linear algebraic equations in three variables by Jacobi's method and Gauss-Seidel method. Computation of largest Eigen value of a square matrix by power method. Solutions of initial value problems for ordinary linear first order differential equations by Taylor's series, Euler's and Euler's modified method and Runge-Kutta 4th ordered method.

Teaching pedagogy:

Chalk and talk.

Blue print : B.Sc VI Semester Scheme / Blue print for paper setting DSE-MATH-606(a) Max. Marks 70

Sl. No.	Name of the Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	10 Marks
1.	Complex Analysis	42	65	05	05	03
2.	Numerical Methods-II	18	39	02	03	02
	Total	**60**	**104**	**07**	**08**	**05**

B. Sc VI SEMESTER
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.

I. Define/Solve any FIVE of the following (Out of 7) 5 X 2 = 10
II. Solve any SIX of the following (Out of 8) 6 X 5 = 30
III. Solve any THREE of the following (Out of 5) 3 X10 = 30

Reference Books :

1. Complex Analysis - S. Shanthinarayan
2. Complex Analysis - L. V. Ahlfors
3. Theory of functions of Complex variables – Dr. R. K. Gupta
4. Introduction to Methods of Numerical Analysis – S. S. Shasthry
5. Finite differences and Numerical Analysis – H. C. Saxena

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
Complex analysis and Numerical methods-II DSE-MATH-606 (A)- P

Teaching Hours : 03 **CIA Marks : 15**
Examination Hours : 03 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Understand the basic properties of elementary transformations
2. Examine the Numerical solutions of algebraic and transcendental equations.

Course Outcome : Students will able to

DSE-MATH-606 (A)- P.1 : Examine numerical solutions of algebraic and transcendental equations
DSE-MATH-606 (A)- P.2 : Solve numerical solutions of non-homogeneous system of linear equations in three variables using Jacobi's method and Gauss Seidal method.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-606 (A)- P.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-606 (A)- P.2	2	1	-	1	2	-	-	-	-	-	1	1	1

Course content :

List of Programs :

1. Some problems on Cauchy-Riemann equations (polar form).
2. Implementation of Milne-Thomson method of constructing analytic functions (simple examples).
3. Illustrating orthogonality of surfaces obtained from the real and imaginary parts of an analytic function.
4. Verifying real and imaginary parts of an analytic function being harmonic (in polar coordinates).
5. Illustrating the angle preserving property in a transformation.
6. Illustrating that circles are transformed to circles by a bilinear transformation.
7. Examples connected with Cauchy's integral theorem.
8. Solving algebraic equations (Bisection method).
9. Solving algebraic equations (Regular-Falsi and Newton-Raphson methods).
10. Solving System of equations (Jacobi and Gauss-Seidal methods).
11. Solving ordinary differential equation by modified Euler's method.
12. Solving ordinary differential equation by Runge-Kutta method of 4th order.

Teaching pedagogy:

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
Linear Programming, Fourier Transforms and Vector Calculus DSE-MATH-606 (B)- T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 03 **SEE : 70**
Scheme (L:T:P) 4:0:0 **Credits : 04**

Course Objectives : The course will enable the students to

1. Discuss the basic concepts of the gradient, divergence, and curl.
2. Demonstrate the example on Fourier series.
3. Maximize or minimize the numerical value of an objective function.

Course Outcome : Students will able to

DSE-MATH-606 (B)- T.1 : Maximize or minimize the given objective function by Graphical method and Simplex method.
DSE-MATH-606 (B)- T.2: Demonstrate the examples on Fourier series.
DSE-MATH-606 (B)- T.3: Study the vector differentiation and integration in two and three dimensional spaces.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-606 (B)- T.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-606 (B)- T.2	2	1	-	1	2	-	-	-	-	-	1	1	1
DSE-MATH-606 (B)- T.3	1	1	-	2	2	-	-	-	-	-	2	2	1

Course content:

Unit I: Linear Programming **-20 Hrs.**

Linear inequality and their graphs. Statement of linear programme. Problem in standard form – classification of solutions – solution of linear programming, problems by graphical method. Illustrative examples on the solution of linear programming, problems in two and three variables by the simplex method,.

Unit-II: Fourier Transforms: **-25 Hrs.**

The Fourier Integral, Complex fourier transform, Inverse transform - basic properties, Transforms of derivative and Derivative of a transforms and examples. Fourier sine and cosine transforms and inverse transforms for first and second order derivative and examples.

Unit-III: Vector Calculus **-15 Hrs.**

Dot and Cross product of vectors. Ordinary derivatives of vectors. Continuity and differentiability of a vector function. Derivatives of sum, dot product, cross product and triple products of vectors. Differential of vectors. The vector differential operator dell. The gradient, divergence and curl. Solenoidal and irrotational vectors.

Teaching pedagogy :

Chalk and talk

Blue print: B.Sc VI Semester Scheme/Blue print for paper setting Max. Marks 70

Sl. No.	Name of the Topic	Teaching Hrs	Marks per Unit	2 Marks	5 Marks	10 Marks
1.	Linear Programming	20	37	02	03	02
2.	Fourier Transforms	25	39	03	03	02
3.	Vector Calculus	15	24	02	02	01
	Total	**60**	**104**	**07**	**08**	**05**

B. Sc VI SEMESTER
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.

I. Define/Solve any FIVE of the following (Out of 7) 5 X 2 = 10

II. Solve any SIX of the following (Out of 8) 6 X 5 = 30

III. Solve any THREE of the following (Out of 5) 3 X10 = 30

Reference Books :

1. Operations Research - Taha
2. Operations Research - S.D.Sharma
3. Higher Engineering mathematics - S. Grewal
4. Integral Calculus - M. D. Raisinghania
5. Integral calculus - H.S.Dhami

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
Linear Programming, Fourier Transforms and Vector Calculus DSE-MATH-606 B- P

Teaching Hours : 03 **CIA Marks : 15**
Examination Hours : 03 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Understand the concepts of Green's theorem, Gauss divergence theorem, and stokes theorem.
2. Demonstrate the examples on Fourier series

Course Outcome : Students will able to

DSE-MATH-606 B- P.1 : Design the Scilab program to verify Greens theorem , Gauss divergence theorem, and stokes theorem

DSE-MATH-606 B- P.2: Solving problems on Fourier integral, complex Fourier transform, and inverse transform.

DSE-MATH-606 B- P.3: Demonstrate the examples on Fourier series using scilab software.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
DSE-MATH-606 B- P.1	1	1	-	2	2	-	-	-	-	-	2	2	1
DSE-MATH-606 B- P.2	2	1	-	1	2	-	-	-	-	-	1	1	1
DSE-MATH-606 B- P.3	1	1	-	2	2	-	-	-	-	-	2	2	1

Course content :

List of Programs :

1. Verifying Green's theorem.
2. Verifying Gauss divergence theorem.
3. Verifying Stoke's theorem.
4. Finding the Fourier Integral, Complex Fourier transform, Inverse transform.
5. Fourier sine and cosine transforms and inverse transforms for first and second order.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair.2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
SEC 4.1: Boolean Algebra SEC-MATH-606(A)- T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 01 1/2 **SEE : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course Objectives : The course will enable the students to

1. Describe the basic properties of ordered set, duality principle, maximal and minimal elements and Concept of lattice, complete lattice, sub-lattices.
2. Apply the properties of modular and distributive lattices, Boolean algebras and Boolean polynomials and Quinn-McCluskey method and Karnaugh diagrams.

Course Outcome : Students will able to

SEC-MATH-606(A)- T.1 : Explain the basic properties of ordered set, duality principle, maximal and minimal elements and Concept of lattice, complete lattice, sub-lattices.

SEC-MATH-606(A)- T.2: Apply the properties of modular and distributive lattices, Boolean algebras and Boolean polynomials and Quinn-McCluskey method and Karnaugh diagrams.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-606(A)- T.1	1	1	-	2	2	-	-	-	-	-	2	2	1
SEC-MATH-606(A)- T.2	2	1	-	1	2	-	-	-	-	-	1	1	1

Course content :

Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products and homomorphisms. Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials, Quinn-McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.

Teaching pedagogy :

Chalk and talk

B. Sc VI SEMESTER
MODEL QUESTION PAPER (THEORY)
SEC- Model Question Paper

Time: 90 min **Max. Marks: 35**

Instructions: Answer all the questions.

Q I.	Define/Solve any FIVE of the following (Out of 7)	5x2=10
Q II.	Solve any THREE of the following (Out of 5)	3x5=15
Q III.	Solve any ONE of the following (Out of 2)	1x10=10

Reference Books :

1. B A. Davey and H. A. Priestley, Introduction to Lattices and Order, Cambridge University Press, Cambridge, 1990.
2. Rudolf Lidl and Günter Pilz, Applied Abstract Algebra, 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
SEC 4.1: Boolean Algebra SEC-MATH-606(A)-P

Teaching Hours : 02 **CIA Marks : 15**
Examination Hours : 02 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Describe the basic properties of ordered set, duality principle, maximal and minimal elements and Concept of lattice, complete lattice, sub-lattices.
2. Apply the properties of modular and distributive lattices, Boolean algebras and Boolean polynomials and Quinn-McCluskey method and Karnaugh diagrams.

Course Outcome: Students will able to

SEC-MATH-606(A)-P.1: Explain the basic properties of ordered set, duality principle, maximal and minimal elements and Concept of lattice, complete lattice, sub-lattices.

SEC-MATH-606(A)-P.2: Apply the properties of modular and distributive lattices, Boolean algebras and Boolean polynomials and Quinn-McCluskey method and Karnaugh diagrams.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-606(A)-P.1	2	1	-	1	2	-	-	-	-	1	2	1	1
SEC-MATH-606(A)-P.2	1	1	-	2	2	-	-	-	-	1	2	1	1

Course content :

List of Programs :

1. Scilab code on maximal and minimal elements.
2. Scilab code on lattices.
3. Scilab code on Quinn-McCluskey method.
4. Scilab code on karnaugh Diagrams.
5. Scilab code on switching circuits.
6. Scilab code on Boolean polynomials.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example : M. Affouf 2012, ISBN: 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
SEC 4.2: Transportation and Game SEC-MATH-606(B)-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 01 1/2 **SEE : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course Objectives : The course will enable the students to

1. Understand the concept of northwest corner method, least cost method and Vogel approximation method to solve transportation problems.
2. Understand the concept of Hungarian method to solve assignment problems.

Course Outcome : Students will able to

SEC-MATH-606(B)-T.1: Formulate the transportation problem and solve by using the various methods such as northwest corner method, least cost method and Vogel approximation method.
SEC-MATH-606(B)-T.2: Make use of Hungarian method to solve assignment problems.
SEC-MATH-606(B)-T.3: Examine two people zero sum games with mixed strategies.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-606(B)-T.1	1	2	-	2	2	-	-	-	-	1	1	1	1
SEC-MATH-606(B)-T.2	1	1	-	2	2	-	-	-	-	1	1	2	1
SEC-MATH-606(B)-T.3	2	1	-	2	2	-	-	-	-	1	2	1	1

Course content :

Transportation problem and its mathematical formulation, northwest-corner method, least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem. Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure.

Teaching pedagogy :

Chalk and talk

Blue print:

B. Sc VI SEMESTER
MODEL QUESTION PAPER (THEORY)
SEC- Model Question Paper

Time: 90 min **Max. Marks: 35**

Instructions: Answer all the questions.

Q I.	Define/Solve any FIVE of the following (Out of 7)	5x2=10
Q II.	Solve any THREE of the following (Out of 5)	3x5=15
Q III.	Solve any ONE of the following (Out of 2)	1x10=10

Reference Books :

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network Flows, 2nd Ed., John Wiley and Sons, India, 2004.
2. F. S. Hillier and G. J. Lieberman, Introduction to Operations Research, 9th Ed., Tata McGraw Hill, Singapore, 2009.
3. Hamdy A. Taha, Operations Research, An Introduction, 8th Ed., Prentice-Hall India, 2006.

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
SEC 4.2: Transportation and Game Theory SEC-MATH-606(B)- P

Scheme (L:T:P) 0:0:1 **Credits: 01**
Teaching Hours : 02 **CIA Marks : 15**
Examination Hours : 02 **SEE : 35**

Course Objectives : The course will enable the students to

1. Understand the concept of two person zero sum games with mixed strategies.
2. Understand the concept of graphical solution procedure for game theory.

Course Outcome : Students will able to

SEC-MATH-606(B)- P.1: Design Scilab program for solving transportation problem using least cost method and vogel approximation method.

SEC-MATH-606(B)- P.2: Construct program to solve transportation problem using TORA software.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-606(B)- P.1	2	1	-	1	2	-	-	-	-	1	2	1	1
SEC-MATH-606(B)- P.2	1	1	-	2	2	-	-	-	-	1	2	1	1

Course content :

List of Programs :

1. Scilab code on least cost methods.
2. Scilab code on Vogel approximation methods.
3. Scilab code on assignment problems.
4. Problems on game theory.
5. Problems on graphical solutions.
6. Scilab code on transportation problems.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

- Write program 20 marks
- Program execution 05 marks
- Journal 05 marks
- Viva 05 marks

35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
SEC4.3: Graph Theory SEC-MATH-606(C)-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 01 1/2 **SEE : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course Objectives : The course will enable the students to

1. Understand the basic concepts of graph theory to solve applied problems.
2. Supplement with some algorithms for the presented problems.

Course Outcome : Students will able to

SEC-MATH-606(C)-T.1: Identify basic concepts of graph theory to solve problems.
SEC-MATH-606(C)-T.2: Computes the distance in graphs, weighted graphs and find the shortest paths.
SEC-MATH-606(C)-T.3: Apply the algorithms that are treated in the course for problem solving.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-606(C)-T.1	2	2	-	1	1	-	-	-	-	1	2	2	1
SEC-MATH-606(C)-T.2	2	1	-	1	1	-	-	-	-	1	1	1	2
SEC-MATH-606(C)-T.3	2	2	-	2	2	-	-	-	-	1	2	1	2

Course content :

Definition, examples and basic properties of graphs, pseudographs, complete graphs, bi-partite graphs, isomorphism of graphs, paths and circuits, Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd-Warshall algorithm.

Teaching pedagogy :

Chalk and talk

Blue print:

B. Sc VI SEMESTER
MODEL QUESTION PAPER (THEORY)
SEC- Model Question Paper

Time: 90 min **Max. Marks: 35**

Instructions: Answer all the questions.

Q I.	Define/Solve any FIVE of the following (Out of 7)	5x2=10
Q II.	Solve any THREE of the following (Out of 5)	3x5=15
Q III.	Solve any ONE of the following (Out of 2)	1x10=10

Reference Books :

1. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory 2nd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2003.
2. Rudolf Lidl and Günter Pilz, Applied Abstract Algebra, 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

DEPARTMENT OF MATHEMATICS
Semester VI (CBCS)
SEC4.3: Graph Theory SEC-MATH-606(C)-P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 02 **SEE : 35**
Scheme (L:T:P) 0:0:1 **Credits : 01**

Course Objectives : The course will enable the students to

1. Have good Knowledge of graph theory, graph properties and formulations of typical graph problems.
2. Impact the Knowledge of Graph theory using scilab program.

Course Outcome : Students will able to

SEC-MATH-606(C)-P.1: Analyze Depth-First search and Breadth –First search using scilab program.
SEC-MATH-606(C)-P.2: Identify minimum spanning of tree and finding the number of simple paths from one point to another in a given graph.

Mapping of Co with PO and PSO :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
SEC-MATH-606(C)-P.1	2	1	-	1	2	-	-	-	-	1	2	1	1
SEC-MATH-606(C)-P.2	1	1	-	2	2	-	-	-	-	1	2	1	1

Course content :

List of Programs :

1. Sci-lab code Breadth First Search Traversal
2. Sci-lab code Depth First Search Traversal
3. Sci-lab code Finding Transitive Closure
4. Sci-lab code Finding the number of simple paths from one point to another in a given graph
5. Sci-lab code Paths and Connectivity.
6. Sci-lab code Minimum Spanning tree.
7. Sci-lab code Adjacency matrix.
8. Sci-lab code Path Matrix.

Teaching pedagogy :

Chalk and talk, Free and Open Source Softwares.

Scheme for practical examination

• Write program	20 marks
• Program execution	05 marks
• Journal	05 marks
• Viva	05 marks
	35 mark

Reference Books :

1. Jain, Advanced programming in scilab.
2. Gayathri P. Sketching curves with programmes in maxima.
3. Scilab by example : M. Affouf 2012, ISBN : 978-1479203444 Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011S. Chand and Company

DEPARTMENT OF BOTANY
Semester-V (CBCS)
ECONOMIC BOTANY DSE-Bot-505 A

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives : This course (DSCBot-101) will enable the students to

1. Explain the role of saprophyte, gametophyte and alternation of generations archegoniate.
2. Identify the types of microorganisms found on food
3. Identify various types of fungus, diseases & its control measures.
4. To know the economic importance of microbes and algae

Course Outcome : After successfully completion of the course, student are able to;

DSC-Bot-101-T.1 - Evaluate the cell structure, life cycle and functions of microorganisms.
DSC-Bot-101-T.2 - dentify types of algae based on morphology and economic importance of algae.
DSC-Bot-101-T.3 - Categorize fungal diversity.
DSC-Bot-101-T.4 - Differentiate lower to higher forms of plant kingdom.

Mapping of CO with PO and PSO :

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSC-Bot-101-T.1	3	2	3	2	3	3	1	2	2	1	3	3	3
DSC-Bot-101-T.2	2	3	3	3	3	3	2	1	2	2	3	3	3
DSC-Bot-101-T.3	3	3	3	2	2	3	3	3	3	2	3	3	3
DSC-Bot-101-T.4	3	3	3	3	3	3	3	3	3	1	3	3	3

1. Microbiology: Prions and Viroids **8 hrs**

Viruses : General structure, DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Multiplication; Economic importance of viruses; Bacteria– Archae, Cyanobacteria (Nostoc) and Eubacteria: General characteristics and cell structure; Reproduction - vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

2. Algae: **12 hrs**

General characteristics : distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: Chlamydomonas, Oedogonium, Vaucheria, Sargassum, Battrachospermum. Economic importance of algae

3. Fungi: **12 hrs**

Introduction- General characteristics, range of thallus organization, cell wall composition, nutrition, reproduction and classification;

True Fungi- life cycle of Rhizopus (Zygomycota) Penicillium, Albugo, (Ascomycota), Puccinia, (Basidiomycota);

Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

4. Archegoniates: 1 hrs

Unifying features of archegoniates, Transition to land habit, Alternation of generations.

1. Bryophytes 7 hrs

General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Marchantia and Funaria. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum.

2. Pteridophytes 10 hrs

General characteristics, classification, Early land plants (Lygenopteris and Rhynia). Classification (up to family), morphology, anatomy and reproduction of Selaginella, Equisetum and Nephrolepis. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

3. Gymnosperms 7 hrs

General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of Cycas and Pinus. (Developmental details not to be included). Ecological and economical importance.

5. Origin of species (Chemical theory of evolution) and Organic evolution (Neo-Darwinism) 3 hrs

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1.	Microbiology	8	14	01/02	1 or 2	0 or1	15
2.	Algae	12	21	01	02	01	22
3.	Fungi	12	21	01	02	01	22
4.	Introductioin to Archegoniates and Bryophytes	8	14	01/02	1 or 2	0 or1	14
5.	Pteridophytes	10	17	01	01	01	17
6.	Gymnosperms, Origin of species and Organic evolution	10	17	01/02	1 or 2	0 or 1	17
7.	**Total**	**60**	**104**	**07**	**08**	**05**	

MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 = 10
II. Answer / Explain any SIX of the following (Out of 8) 6 X 5 = 30
III. Answer / Describe in detail any THREE of the following (Out of 5) 3 X10 = 30

Reference Book :

1. Kumar, H. D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G. J., Funke, B. R., Case, C. L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U. S. A. 10th edition.
3. Sethi, I. K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C. J., Mims, C. W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P. H., Johnson, G. B., Losos, J. B., Singer, S. R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P. C., Sinha, A. K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N. S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad
9. G. M. Smith. A textbook of Cryptogamic Botany (Vol. I & II)
10. Ganguli Das, Datta and Kar. College Botany

DEPARTMENT OF BOTANY

Semester-V (CBCS)

Microbiology, Algae, Fungi, Archegoniate Origin of Species and Organic evolution Practical DSC-Bot-101-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 2**

Course objectives: This course (DSE-Bot-505 A) will enable the students to

1. To explain importance of cultivated plants.
2. Emphasize on cultivation techniques of Wheat and Rice, Millets – Pearl, Bajra, Ragi, Kudo, Proso.
3. Describe economic importance of Legumes.
4. Explain medicinal Plants and essential oils.

Course Outcome: After successfully completion of the course, student are able to;

DSE-Bot-505-T.1- Memorize botanical name, family part used of legumes, pulses, oil yielding plants.
DSE-Bot-505-T.2- Identify different medicinal plants.
DSE-Bot-505-T.3- Explain cultivation techniques of plants
DSE-Bot-505-T.4- Rate the economic value of plants.

Mapping of CO with PO and PSO :

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSE-Bot-505-T.1	3	3	3	3	3	3	3	3	2	3	3	3	3
DSE-Bot-505-T.2	3	3	3	3	3	3	3	3	3	3	3	3	3
DSE-Bot-505-T.3	3	3	3	3	3	3	3	2	3	2	3	3	3
DSE-Bot-505-T.4	3	3	3	3	3	3	3	2	2	2	3	3	3

Unit 1: Origin of Cultivated Plants **4 hrs**

Concept of centres of origin, their importance with reference to Vavilov's work

Unit 2: Cereals and Millets **10 hrs**

Wheat and Rice, Pearl Millet, Bajra and Ragi -Origin, morphology, uses

Unit 3: Legumes **6 hrs**

General account with special reference to Pigeon pea, Tur dal, horse gram and soybean

Unit 4: Spices and Condiments **10 hrs**

General account with special reference to clove, Cardamom, Cinnamomum, Vanilla and black pepper (Botanical name, family, part used, morphology and uses)

Unit 5: Beverages **5 hrs**

Tea, Coffee and Cocoa (morphology, processing, uses)

Unit 6: Oils and Fibre Yielding Plants **6 hrs**

General description with special reference to groundnut, sunflower and safflower; Cotton, Jute, Coconut (Botanical name, family, part used morphology and uses)

Unit 7: Drugs and Narcotics **8 hrs**

General description with special reference to Opium, Cannabis, Tobacco

(Botanical name, family, part used morphology and uses)

Unit 8: Medicinal Plants and essential oils **12 hrs**

General description with special reference to Amruthballi, Ashwagandha, Sarpaghandha, Noni, Adhathoda, Amla, Sandal wood, Rakhtha Chandana, Turmeric (Botanical name, family, part used morphology and uses).

General description with special reference to Amruthballi, Ashwagandha, Sarpaghandha, Noni, Adhathoda, Amla, Sandal wood, Tulsi, Aloe vera, Turmeric (Botanical name, family, parts used morphology and uses).

Types of Secondary metabolites: Phenols, Alkaloids, Terpenoids and their biological importance

Essential oils- Lemon grass, Geranium, Ruta graveolens, Jasmine, Eucalyptus, Lavender (Botanical name, family, parts used morphology and uses).

Teaching Pedagogy:

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

Name of the topics	Teaching hours	Marks Per unit	2 Marks	5 Marks	10 Marks	Total marks
Origin of Cultivated Plants	4	08	01	0/1	00/01	10
Cereals and Millets	10	17	01	01	01	17
Legumes	6	10	-	01/2	00/01	10
Spices and Condiments	10	17	01	01	01	17
Beverages	4	08	01	0/01	00/01	10
Oils and Fibre Yielding Plants	6	10	-	0/01	00/01	10
Drugs and Narcotics	8	14	01/2	0/01	00	14
Medicinal Plants and essential oils	12	21	01	01/02	01	22

MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 = 10
II. Answer / Explain any SIX of the following (Out of 8) 6 X 5 = 30
III. Answer / Describe in detail any THREE of the following (Out of 5) 3 X10 = 30

Reference Book :

1. Pandey, B.P. Economic Botany

DEPARTMENT OF BOTANY

Semester-V (CBCS)

ECONOMIC BOTANY PRACTICAL DSE-Bot-505 A-P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 2**

Course objectives: This course (DSE-Bot-505 A) will enable the students to

1. To explain importance of cultivated plants.
2. Emphasize on cultivation techniques of Wheat and Rice, Millets – Pearl, Bajra, Ragi, Kudo, Proso.
3. Describe economic importance of Legumes.
4. Explain medicinal Plants and essential oils.

Course Outcome: After successfully completion of the course, student are able to;

DSE-Bot-505-P.1- Identify different medicinal plants.
DSE-Bot-505-P.2- Demonstrate cultivation techniques of plants.
DSE-Bot-505-P.3- Measure the economic uses of plants.
DSE-Bot-505-P.4- Memorize the classification of plants.

Mapping of CO with PO and PSO:

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSE-Bot-505-P.1	2	3	3	3	3	3	3	3	2	3	3	3	3
DSE-Bot-505-P.2	3	3	2	3	3	3	3	3	3	3	3	3	3
DSE-Bot-505-P.3	2	2	3	3	2	3	3	3	3	3	3	3	3
DSE-Bot-505-P.4	3	2	2	3	2	3	2	2	2	3	3	3	3

Teaching Pedagogy :

Live demonstration of the specimens, medicinal plants

1. Study of locally available medicinal plants.
2. Botanical name, family, parts used and economic uses of wheat and rice, millets – pearl, bajra, ragi, kodo, proso, pigeon pea, horse gram and soybean.
3. Botanical name, family, parts used and economic uses of clove, Cardamom, Cinnamomum, Black pepper, Vanilla, Cocoa, Tea and Coffee.
4. Botanical name, family, parts used and economic uses of groundnut, sunflower, safflower, Cotton, Jute and Coconut.
5. Extraction of Secondary metabolites by using soxhlet apparatus.
6. Phytochemical tests for Phenols, Alkaloids, Terpenoids
7. Study of anti-microbial activity of extracted phytochemicals.
8. Field visit to local medicinal plant garden/research stations.

Question Paper

1. Identify and write the Botanical name, family, parts used and economic uses of given specimens A, B, C, D & E. 15 marks
2. Phytochemical tests for given sample. Show the observation to the examiner 4 Marks
3. Identify given slide/material/specimen F, G, H & I 8 Marks
4. Field report/ Project 6 marks
5. Journal 2 Marks

Scheme of Valuation

1. Identify and write the Botanical name, family, parts used and economic uses of given specimens A, B, C, D & E. 15 marks
   Botanical name- ½ mark, Family- ½ mark, part used- 1mark, economic uses- 1 mark 3x5= 15
2. Phytochemical tests for given sample. Show the observation to the examiner 4 Marks
   Requirements- 1 mark, Procedure- 1 mark, Observation- 1 mark, Result- 1 mark
3. Identify given slide/material/specimen F, G, H & I 8 Marks
   Identification- ½ mark, explanation- 1 ½ marks
4. Field visit/ Project/ Submission 6 marks
5. Journal 2 Marks

Reference Books

1. Pandey, B.P. Economic Botany

DEPARTMENT OF BOTANY

Semester-V (CBCS)

Genetics and Molecular Biology of Genes DSE-Bot-505 B

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives : This course (DSE-Bot-505 B) will enable the students to

- Explain genetic information and the role of messenger RNA and transfer RNA.
- Gain knowledge about DNA directs protein synthesis
- Describe roles of DNA and proteins in regulating cell function.
- Define transcription and translation.

Course Outcome : After successfully completion of the course, student are able to;

DSE-Bot-505-T.1- List out types of nucleic acids.
DSE-Bot-505-T.2- Evaluate gene interactions.
DSE-Bot-505-T.3- Express sex determination.
DSE-Bot-505-T.4- Differentiate prokaryote and eukaryotic translation.

Mapping of CO with PO and PSO:

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSE-Bot-505-T.1	3	3	3	3	3	3	3	3	3	2	3	3	3
DSE-Bot-505-T.2	3	3	3	3	3	3	3	3	3	2	3	3	3
DSE-Bot-505-T.3	3	3	3	3	3	3	3	3	3	3	3	3	3
DSE-Bot-505-.T.4	3	3	2	3	3	3	2	3	2	3	3	3	3

Unit 1: Post Mendelian Gene interaction **10 hrs**

Supplementary factors: Recessive epistasis (9:3:4 eg., millet), Dominant epistasis, (12:3:1 eg., Sorghum); Complementary genes (9:7 eg., Sweet pea), Mention lethal genes (eg., Snapdragon) &Pseudoallels, Multiple factor inheritance; Grain colour in Wheat (1:4:6:4:1), Multiple allelism in Nicotiana tobaccum.

Unit 2: Linkage and Crossing over **8 hrs**

Characteristics of linkage and crossing over, Types - (Single and Double) & mechanism of crossing over & its significance. Transposable genetic elements (Maize).

Unit 3: Sex determination and Extra-nuclear Inheritance **9 hrs**

Mechanism of sex determination in Melandrium. Plastid inheritance in Mirabilis. Mitochondrial inheritance – Petite character inheritance in Yeast. Uniparental inheritance in Chlamydomonas reinhardi.

Unit 4: Cell Cycle and Mutation **12 hrs**

Cell cycle- Stages, significance, check points. Cell Division- Types and significance, Amitosis, Mitosis and Meiosis; Apoptosis and Cancer; Cell senescence.

Chromosomal Aberrations – numerical and structural variations and their significance. Gene mutation- Spontaneous and induced. Mutagens – Chemical (EMS, MMS etc) and Physical (Temperature, Radiation etc). Role of Mutation in Evolution.

Unit 5: DNA and RNA **14 hrs**

DNA: DNA structure- Watson and Crick model of DNA and DNA packaging, types of DNA (A, B and Z). DNA replication in Prokaryotes and eukaryotes.

RNA: Transcription (Prokaryotes and Eukaryotes), post transcriptional modifications and types of RNA (mRNA, tRNA, rRNA, snRNA).

Unit 6: Protein Biosynthesis **7 hrs**

Concept of gene. Genetic code and its characters, Wobble hypothesis. Translation (Prokaryotes and eukaryotes), post translational modifications (in brief).

Regulation of gene expression- Prokaryotes (Lac operon, Tryptophan operon) and Eukaryotes.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print :

	Name of the topics	Teaching hours	Marks Per unit	2 Marks	5 Marks	10 Marks	Total marks
1.	Post Mendelian Gene interaction	12	20	01/02	01	01	19
2.	Linkage and Crossing over	04	07	01	01	-	07
3.	Sex determination and Extra -nuclear Inheritance	17	30	01/02	01/02	02	30
4.	Cell Cycle and Mutation	06	11	01	02	-	12
5.	Genetic material	10	17	01	01	01	17
6.	Genetic material	11	19	01/02	01	01	19
	Total	**60**	**104**	**07**	**08**	**05**	**104**

MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.

2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 = 10

II. Answer / Explain any SIX of the following (Out of 8) 6 X 5 = 30

III. Answer / Describe in detail any THREE of the following (Out of 5) 3 X10 = 30

Reference Book :

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc: Gupta P. K. Cytology, Genetics and Evolution 7th Edi Rastogi publication.
2. Powar C.B 2005 Cell Biology. Himalaya Publishing House.
3. Karp G.2000 Cell and Molecular Biology: Concepts and Experiments. John Willey and Sons Inc. New York.
4. Robertis & Robertis. 2006. Cell and Molecular biology. 8th Edn Lippincott.Williams and Wilkins Publication.
5. Verma P. S and Agarwal V.K ,2005 Text book of Cell Biology, Genetics, Molecular Biology, Evolution. and Ecology. S. Chand publication.
6. Tamarin R. M. 2000 Principles of Genetics 6th Ed WMC Brown Publication Co London.
7. Gupta P.K. Genetics Rastogi publication.
8. Stickberger M W 1995 Genetics 3rd Edn Prentice Hall Inc London. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
9. Becker, W. M., Kleinsmith, L. J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco. Gardner EJ, Simmons M J, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India
10. Snustad, D. P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
11. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings.
12. Griffiths, A. J. F., Wessler, S.R., Carroll, S. B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
13. Pierce BA (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning.

DEPARTMENT OF BOTANY

Semester-V (CBCS)

Genetics and Molecular Biology of Genes Practical DSE-Bot-505 B –P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 2**

Course objectives : This course (DSEBot-505 B) will enable the students to

- Explain genetic information and the role of messenger RNA and transfer RNA.
- Gain knowledge about DNA directs protein synthesis
- Describe roles of DNA and proteins in regulating cell function.
- Define transcription and translation.

Course Outcome : After successfully completion of the course, student are able to;

DSE-Bot-505-P.1- Estimate plant cell size.
DSE-Bot-505-P.2- Enhance skills in extraction of DNA.
DSE-Bot-505-P.3- Discuss differences in development of plant cells.
DSE-Bot-505-P.4- Evaluate genetic problems.

Mapping of CO with PO and PSO:

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
DSE-Bot-505-P.1	3	3	3	3	3	3	-	2	-	3	3	3	3
DSE-Bot-505-P.2	3	3	3	3	3	3	3	2	-	2	3	3	3
DS-EBot-505-P.3	3	3	3	3	3	2	3	2	-	3	3	3	3
DSE-Bot-505-P.4	3	3	3	2	2	3	-	2	-	2	3	3	3

Teaching Pedagogy :

Live demonstration of mounting the specimens, sectioning, staining

1. Micrometry - Measurement of cell size (length and breadth/ diameter).
2. Study of mitosis
3. Study of meiosis
4. Preparation of karyotype (using charts) and idiogram from given photograph of somatic metaphase chromosomes (Allium cepa/Aloe vera).
5. Chromosomal aberrations by micrographs
6. DNA extraction from plant tissue (Rapid method).
7. Genetic Problems (Complementary, supplementary, dominant epistasis, multiple factor inheritance)
8. Revision

Question Paper

1. Measure the cell size (either length or breadth/diameter) by micrometry.
2. Study of mitosis
3. Study of meiosis (temporary mounts and permanent slides).
4. Preparation of the karyotype and idiogram from given photograph of somatic metaphase chromosome

5. Study of DNA packaging and Chromosomal aberrations by micrographs
6. DNA Extraction from plant tissue
7. Demonstration of amino acids separation by using paper chromatography
8 Genetic Problems based on theory syllabus (4 practicals)
9 Revision

Scheme of Valuation

1. Make a micropreparation of the material A by squash/Smear method (Draw any two stages). Show the preparation to the examiner.
   Preparation- 2 Marks
   Diagram- 2 Marks
   Viva- 2 Marks **6 Marks**
2. Make a temporary micropreparation of the material B and measure the length and breadth of the cell. Show to the examiner
   Procedure- 2 Marks
   Calibration & Viva- 2 Marks **4 Marks**
3. Extraction of DNA in the given material C. Show to the examiner
   5 Marks
   Procedure- 2 Marks
   Results and Viva- 3 Marks
4. Solve Genetic Problem D and E **8 Marks**
   D- 4 Marks and E- 4 Marks
5. Identify the F, G, H and I. Write the cytological interest found in the slides/Photographs.
   Identification- 1 Mark
   Comment- 1 Mark **4 x 2 = 8 Marks**
6. Journal **4 Marks**

Reference Books

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc: Gupta P. K. Cytology, Genetics and Evolution 7th Edi Rastogi publication.
2. Powar C.B 2005 Cell Biology. Himalaya Publishing House.
3. Karp G. 2000 Cell and Molecular Biology: Concepts and Experiments. John Willey andSons Inc. New York.
4. Robertis & Robertis. 2006. Cell and Molecular biology. 8th Edn Lippincott. Williams andWilkins Publication.
5. Verma P. S and Agarwal V. K ., 2005 Text book of Cell Biology, Genetics, Molecular Biology, Evolution. and Ecology. S. Chand publication.
6. Tamarin R. M. 2000 Principles of Genetics 6th Ed WMC Brown Publication Co London.
7. Gupta P. K. Genetics Rastogi publication.
8. Stickberger M. W .1995 Genetics 3rd Edn Prentice Hall Inc London. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
9. Becker, W.M., Kleinsmith, L. J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco. Gardner EJ, Simmons M J, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India
10. Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
11. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings.
12. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
13. Pierce BA (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning.

DEPARTMENT OF BOTANY

Semester-V (SEC)

Medicinal Botany SEC-Bot-505-B -T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1 ½ **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 2**

Course objectives : This course (SEC-Bot- 505 B) will enable the students to

- Gain knowledge about Indigenous Medicinal Sciences like Ayurveda, Sidda, Unani.
- Define Endemic and endangered medicinal plants.
- Understand Propagation and conservation methods of medicinal plants.
- Gain knowledge about ethnomedicinal preparations for certain diseases like Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

Course Outcome : After successfully completion of the course, student are able

SEC-Bot-505-T.1- Outline the traditional use of medicinal plants.
SEC-Bot-505-T.2- Analyze the role of herbal remedies in modern society.
SEC-Bot-505-T.3- Explain the identification and cultivation methods of medicinal plants.
SEC-Bot-505-T.4- Interpret the problems associated with conservation and use of medicinal plants.

Mapping of CO with PO and PSO:

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
SEC-Bot-505-T.1	3	3	3	3	3	3	3	2	3	3	3	3	3
SEC-Bot-505-T.2	3	3	3	3	3	3	3	2	3	3	3	3	3
SEC-Bot-505-T.3	3	3	3	3	3	3	3	3	3	2	3	3	3
SEC-Bot-505-T.4	3	3	3	3	2	3	3	3	3	2	3	3	3

Unit 1: **10 hours**

History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinalsystems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations.

Unit 2: **10 hours**

Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves,sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.

Unit 3: **10 hours**

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics,Blood pressure and skin diseases

Teaching Pedagogy :

Chalk and talk, Power point Presentation, seminars, assignment.

Blue print:

Sl.No	Unit	Name of the topic	Teaching hour	Marks per unit	2	5	10	Total
1	Unit I	History, Scope and Importance of Medicinal Plants 10	17	1/2	1/2	0/1	17	
2	Unit II	Conservation of endangered and endemic medicinal plants	10	17	1/2	1/2	0/1	17
3	Unit III	Ethnobotany and Folk medicines	10	17	1/2	1/2	0/1	17
		Total	**30**	**51**	**7**	**5**	**2**	

MODEL QUESTION PAPER (THEORY)

TIME: 1 Hr 30 Min. **Max Marks: 35**

Instructions: 1. Answer all the questions

2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 = 10

II. Answer/ Explain any THREE of the following (Out of 5) 3 X 5 = 15

III. Answer/ Describe in detail any ONE of the following (Out of 2) 1 X 10 = 10

Reference Book :

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2ndedn. Agrobios, India.

DEPARTMENT OF BOTANY

Semester-V (SEC)

Medicinal Botany Practical SEC- Bot-505 B -P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 2**

Course objectives : This course (SEC-Bot-505) B will enable the students to

- Gain knowledge about Indigenous Medicinal Sciences like Ayurveda, Sidda, Unani.
- Define Endemic and endangered medicinal plants.
- Understand Propagation and conservation methods of medicinal plants.
- Gain knowledge about ethnomedicinal preparations for certain diseases like Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

Course Outcome : After successfully completion of the course, student are able to;

SEC-Bot-505-P.1- Outline the traditional use of medicinal plants.
SEC-Bot-505-P.2- Analyze the role of herbal remedies in modern society.
SEC-Bot-505-P.3- Describe the use of raw herbal medicine in primary health care.
SEC-Bot-505-P.4- Revise the skills in preparation of herbal medicines.

Mapping of CO with PO and PSO:

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CBMB	CBBT
SEC-Bot-505-P.1	3	3	3	3	3	3	3	3	3	3	3	3	3
SEC-Bot-505-P.2	3	3	3	3	3	3	3	3	3	2	3	3	3
SEC-Bot-505-P.3	3	3	3	3	3	3	2	3	2	3	3	3	3
SEC-Bot-505-P.4	3	3	3	3	3	3	3	3	3	2	3	3	3

Teaching Pedagogy :

Live demonstration of mounting the specimens, sectioning, staining

1. Identification of medicinal plants used for common diseases (2 practicals)
2. Study of immunity boosting medicinal plants
3. Cultivation of medicinal plants by stem cutting, leaf cutting, vegetative propagation.
4. Extraction and estimation of drugs (2 practicals)
5. Visit to ethnomedicinal gardens
6. Project on medicinal plants.

1. Estimation of A Curcumin/Lycopene **7 marks**
2. Identify and write the Botanical name, family, parts used and economic uses of given specimens B, C, D **9 marks**
3. Identify given slide/material/specimen E, F, G, H & I **10 Marks**
4. Project **4 marks**
5. Field visit **3 marks**
6. Journal **2 Marks**

Scheme of Valuation :

1. Estimation of A. **7 marks**
   REQUIREMENTS-1, PROCEDURE- 4 MARKS, CALULATION- 1, CONCLUSION- 1 MARK
2. Identify and write the Botanical name, family, parts used and uses of given specimens B, C, D Identification- ½ mark, botanical name, family, part used- 1 ½ marks, uses- 1 mark **9 marks**
3. Identify given slide/material/specimen E, F, G, H & I **10 Marks**
   E- VEGETATIVE PROPOAGATION, IDENTIFICATION- ½ MARK, COMMON NAME, BOTANICAL NAME, PART USED AND USES- 1 ½ MARKS
4. Project **4 marks**
5. Field visit **3 marks**
6. Journal **2 Marks**

Reference Books :

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2ndedn. Agrobios, India.

DEPARTMENT OF ZOOLOGY
Semester-V (CBCS)
Applied Zoology DSE-ZOO-505A-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:4 **Credits : 6**

Course objectives :This course will enable the students

1. To gain knowledge about the host-parasite relationships in the environment
2. To learn the life history of many parasitic protozoa
3. To study the economic importance of insects
4. To study various aspects of animal husbandry and aquaculture

Course Outcome : On completion of the course, students are able:

DSE-ZOO-505A-T.1- To describe the relationship, life history and pathogenesis of parasitic protozoa
DSE-ZOO-505A-T.2- To state the economic importance, biology and damage caused by the insects
DSE-ZOO-505A-T.3- To discuss aspects of animal husbandry.
DSE-ZOO-505A-T.4- To describe the fin and shell fisheries

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-505A-T.1	1				3	3							3	3	3
DSE-ZOO-505A-T.2	1				3	3							3	3	3
DSE-ZOO-505A-T.3	2				3	3							3	3	3
DSE-ZOO-505A-T.4	1				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Introduction to Host-parasite Relationship** Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis Unit. Epidemiology of Disease Transmission, Prevention and control of diseases: Tuberculosis, typhoid Rickettsiae and Spirochaetes Brief account of Rickettsia prowazekii, Borreliarecurrentis and Treponemapallidum	**12**
II	**Parasitic Protozoa** Life history and pathogenicity of Entamoebahistolytica, Plasmodium vivax and Trypanosomagambiense Parasitic Helminthes Life history and pathogenicity of Ancylostomaduodenale and Wuchereriabancrofti	12
III	**Insects of Economic Importance** Biology, Control and damage caused by Helicoverpa Armigera, Pyrilla Perpusilla and Papiliodemoleus, Callosobruchus Chinensis, Sitophilusoryzae and Triboliumcastaneum	

Insects as vectors

Medical importance and control of Pediculushumanuscorporis, Anopheles, Culex, Aedes, Xenopsyllacheopis 12

IV Animal Husbandry

Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle Cattle by products Poultry Farming Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs Poultry by products 12

V Aquaculture

Induced breeding and transportation of fish Seed. Common diseases. Shell fishery: Pearl culture and Prawn culture. Byproducts of fisheries and shell fisheries. 12

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	2	2	1	5	24
II	2	2	1	5	24
III	1	1	1	3	17
IV	1	2	1	4	22
V	1	1	1	3	17
Total No. of questions	**07**	**08**	**05**		104
Total marks	**14**	**40**	**50**	**20**	

Reference Book :

1. Park, K. (2007).Preventive and Social Medicine. XVIEdition. B. B Publishers.
2. Arora, D. R and Arora, B. (2001). Medical Parasitology. II Edition. CBS Publicationsand Distributors.
3. Kumar and Corton. Pathological Basis of Diseases.
4. Atwal, A. S. (1986). Agricultural Pests of India and South East Asia, Kalyani Publishers.
5. Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).
6. Hafez, E. S. E. (1962). Reproduction in Farm Animals. Lea &Fabiger Publisher
7. Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches.
8. CABI publications, U.K.
9. Pedigo, L.P. (2002). Entomology and Pest Management

B. Sc V SEMESTER A
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2	Write a note on / Explain/sketch and label- any three of the following (Out of four)	6X 05 = 30
3	Answer / describe in detail any THREE of the following (Out of 5)	10X 03 = 30

DEPARTMENT OF ZOOLOGY
Semester-V Practical (CBCS)
Applied Zoology DSE-ZOO-505A-P

Teaching Hours : 4 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 2**

Course objectives : This course will enable the students

1. To study arthropod vectors associated with human diseases
2. To study insect damage to different plant parts/stored grains
3. To study some economically important pests and their identifying features
4. To learn the maintenance of fresh water aquarium

Course Outcome : On completion of the course, students are able:

DSE-ZOO-505A-P.1- To identify arthropod vectors.
DSE-ZOO-505A-P.2- To interpret the economically important pests.
DSE-ZOO-505A-P.3- To inspect insect damage to plants.
DSE-ZOO-505A-P.4- To demonstrate aquarium management skills.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-505A-P.1	1			2		1				2			3	3	3
DSE-ZOO-505A-P.2	1			2		1				2			3	3	3
DSE-ZOO-505A-P.3	1			2		1				2			3	3	3
DSE-ZOO-505A-P.4	2			2		1				2			3	3	3

Course Content :

Sl.No.	**Topics**
1	Study of Plasmodium vivax, Entamoebahistolytica, Trypanosomagambiense, Ancylostomaduodenale and Wuchereriabancrofti and their life stages throughpermanent slides/photomicrographs or specimens.
II	Study of arthropod vectors associated with human diseases: Pediculus, Culex, Anopheles, Aedes and Xenopsylla.
III	Study of insect damage to different plant parts/stored grains through damaged products/photographs.
IV	Identifying feature and economic importance of Helicoverpa (Heliothis) armigera, Papiliodemoleus, Pyrillaperpusilla, Callosobruchuschinensis, Sitophilusoryzae and Triboliumcastaneum
V	Visit to poultry farm or animal breeding centre/dairy/fishery/sericulture. Submission of visit report
VI	Maintenance of freshwater aquarium

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	Marks
I	10
II	15
III(Viva)	05
IV(Journal)	05
Total No. of questions	04
Total marks	**14**

Reference Book :

Arora, D. R and Arora, B. (2001). Medical Parasitology.II Edition. CBS Publications and Distributors.
Atwal, A.S. (1986). Agricultural Pests of India and South East Asia, Kalyani Publishers.
Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).

Scheme of Practical Examination

Qno I	Identify and explain life cycle of ----------	10Marks
Q.No2.	Identification of	
	a) Vectors. b) Economic insects	15Marks
Q.No.3.	Viva	05Marks
Q.No 4.	Journal	05Mark s
	Total	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-V (CBCS)
Animal Biotechnology DSE-ZOO-505B-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:3 **Credits : 4**

Course objectives :This course will enable the students

1. To study the basic concepts of Biotechnology and the molecular techniques involved in it
2. To study the genetically modified organisms
3. To study the culture techniques and applications

Course Outcome : On completion of the course, students are able:

DSE-ZOO-505B-T.1 - To define the terms Biotechnology, cloning, plasmid, cosmid, phagemid
DSE-ZOO-505B-T.2 - To describe molecular techniques used in gene manipulation
DSE-ZOO-505B-T.3 - To name the various culture techniques used in Biotechnology
DSE-ZOO-505B-T.4 - To list the applications of Biotechnology in various fields

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-505B-T.1	1				3	3							3	3	3
DSE-ZOO-505B-T.2	2				3	3							3	3	3
DSE-ZOO-505B-T.3	2				3	3							3	3	3
DSE-ZOO-505B-T.4	2				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Introduction**	
	Concept and scope of biotechnology	06
II	**Molecular Techniques in Gene manipulation**	
	Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics) Restriction enzymes: Nomenclature, detailed study of Type II. Transformation techniques: Calcium chloride method and electroporation.	12
III	**Construction of genomic and cDNA libraries and screening by colony and plaque, hybridization, Southern, Northern and Western blotting; DNA sequencing: Sanger method**	
	Polymerase Chain Reaction, DNA Finger Printing and DNA micro array	12

IV Genetically Modified Organisms

Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection

Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knockout mice 16

V Culture Techniques and Applications

Animal cell culture, expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia)

Recombinant DNA in medicines: Recombinant insulin and human growth hormone, Gene therapy 12

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	2	2	1	5	24
II	2	2	1	5	24
III	1	1	1	3	17
IV	1	2	1	4	22
V	1	1	1	3	17
Total No. of questions	**07**	**08**	**05**		20
Total marks	**14**	**40**	**50**	104	

Reference Book :

1. Brown, T. A. (1998). Molecular Biology Labfax II : Gene Cloning and DNA Analysis. II Edition, Academic Press, California, USA.
2. Glick, B. R. and Pasternak, J. J. (2009). Molecular Biotechnology - Principles and Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA.
3. Griffiths, A. J. F., J. H. Miller, Suzuki, D. T., Lewontin, R.C. and Gelbart, W.M. (2009). An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N. Y., USA.
4. Snustad, D. P. and Simmons, M.J. (2009).Principles of Genetics.V Edition, John Wiley and Sons Inc.
5. Watson, J. D., Myers, R. M., Caudy, A. and Witkowski, J. K. (2007). Recombinant DNA Genesand Genomes-A Short Course. III Edition, Freeman and Co., N.Y., USA.
6. Beauchamp, T. I. and Childress, J. F. (2008). Principles of Biomedical Ethics. VI Edition, Oxford University

B. Sc. V SEMESTER B
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1.	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2.	Write a note on / Explain/sketch and label- any three of the following(Out of four)	6X 05 = 30
3.	Answer / describe in detail any THREE of the following (Out of 5)	10X 03 = 30

DEPARTMENT OF ZOOLOGY
Semester-V Practical (CBCS)
Animal Biotechnology DSE-ZOO-505B-P

Teaching Hours : 3 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credits : 1**

Course objectives : This course will enable the students

1. To study the genomic and plasmid DNA isolation
2. To studyRestriction digestion of plasmid DNA
3. To learn the construction of circular and linear restriction map
4. To study some of the important biotechnology techniques

Course Outcome : On completion of the course, students are able:

DSE-ZOO-505B-P.1 - To demonstrate the genomic DNA isolation.
DSE-ZOO-505B-P.2 - To construct restriction maps.
DSE-ZOO-505B-P.3 - To illustrate biotechnological techniques.
DSE-ZOO-505B-P.4 - To practice animal cell culture techniques.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-505B-P.1	2			2		1							3	3	3
DSE-ZOO-505B-P.2	1			2		1							3	3	3
DSE-ZOO-505B-P.3	3			2		1							3	3	3
DSE-ZOO-505B-P.4	3			2		1							3	3	3

Course Content :

Sl. No. Topics

I Genomic DNA isolation from E. coli
II Plasmid DNA isolation (pUC 18/19) from E. coli
III Restriction digestion of plasmid DNA
IV Construction of circular and linear restriction map from the data provided.
V Calculation of transformation efficiency from the data provided.
VI To study following techniques through photographs
   a) Southern Blotting
   b) Northern Blotting
   c) Western Blotting
   d) DNA Sequencing (Sanger's Method)
   e) PCR
   f) DNA fingerprinting
VII Project report on animal cell culture

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	Marks
I	06
II	20
III	04
IV	05
Total No. of questions	04
Total marks	**35**

Reference Book :

1. Brown, T.A. (1998).Molecular Biology Labfax II: Gene Cloning and DNA Analysis. II Edition, Academic Press, California, USA.
2. Glick, B.R. and Pasternak, J.J. (2009).Molecular Biotechnology - Principles and Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA.
3. Griffiths, A. J. F., J. H. Miller, Suzuki, D. T., Lewontin, R.C. and Gelbart, W.M. (2009). An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA.

Scheme of Practical Examination

Qno I.	**Genomic DNA isolation from E.Coli**	**06Marks**
Q.No 2.	Identification	20Marks
Q.No.3.	Viva	04Marks
Q.No 4	Journal	05Marks
	Total –	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-V Skill Enhancement Course-I
Sericulture SEC-ZOO-505A-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 2**

Course objectives : This course will enable the students

1. To understand the definition, history and present status of Sericulture
2. To study the types of silkworms
3. To study the biology of silkworms along with its life cycle
4. To study the pests and diseases of silkworm

Course Outcome : On completion of the course, students are able:

SEC-ZOO-505A-T.1- To identify and describe different types of silkworms
SEC-ZOO-505A-T.2- To name different appliances used in Sericulture
SEC-ZOO-505A-T.3- To explain different techniques used in rearing of silkworms
SEC-ZOO-505A-T.4- To list the economic importance of rearing the silkworms
SEC-ZOO-505A-T.5- To setup their independent industry/apply for jobs in respective industrial sectors.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-505A-T.1	1				3	3							3	3	3
SEC-ZOO-505A-T.2	1				3	3							3	3	3
SEC-ZOO-505A-T.3	2				3	3							3	3	3
SEC-ZOO-505A-T.4	1				3	3							3	3	3
SEC-ZOO-505A-T.5	2				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Introduction** Sericulture: Definition, history and present status; Silk route Types of silkworms, Distribution and Races Exotic and indigenous races Mulberry and non-mulberry Sericulture	03
II	**Biology of Silkworm** Life cycle of Bombyxmori Structure of silk gland and secretion of silk	03
III	**Rearing of Silkworms** Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances Disinfectants: Formalin, bleaching powder, RKO Silkworm rearing technology: Early age and Late age rearing Types of mountages. Spinning, harvesting and storage of cocoons	05
IV	**Pests and Diseases** Pests of silkworm: Uzi fly, dermestid beetles and vertebrates Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial, Control and prevention of pests and diseases	02
V	**Entrepreneurship in Sericulture** Prospectus of Sericulture in India: Sericulture industry in different states,employment, potential in mulberry and non-mulberry sericulture. Visit to varioussericulture centers	02

Teaching Pedagogy :

Chalk and talk, power point presentationetc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	3	1	1	05	21
II	2	2	1	05	24
III	2	2	1	05	24
Total No. of questions	**07**	**05**	**03**	15	69
Total marks	**14**	**25**	**30**		

Reference Book :

1. Handbook of Practical Sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore
2. Appropriate Sericultural Techniques; Ed. M. S. Jolly, Director, CSR & TI, Mysore. Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan1972.
3. Manual of Silkworm Egg Production; M. N. Narasimhanna, CSB, Bangalore 1988.
   Silkworm Rearing; Wupang - Chun and Chen Da-Chung, Pub.By FAO, Rome 1988.
   A Guide for Bivoltine Sericulture; K. Sengupta, Director, CSR & TI, Mysore 1989.
4. Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.

Semester-V Skill Enhancement Course-I
MODEL QUESTION PAPER (THEORY)

Time: 2.30Hrs **Max Marks: 50**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2	Write a note on / Explain/sketch and label- any three of the following(Out of four)	5X 03 = 15
3	Describe any one of the following (Out of 3)	10X 01 = 10
	Total	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-V Skill Enhancement Course-I Practical
Sericulture SEC-ZOO-505A-P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 2 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 1**

Course objectives :This course will enable the students

1. To study the types of silkworms
2. To study the biology of silkworms along with its life cycle
3. To study the pests and diseases of silkworm
4. To study the various appliances used in Sericulture

Course Outcome : On completion of the course, students are able:

SEC-ZOO-505A-P.1 - To recognize silkworm species.
SEC-ZOO-505A-P.2 - To use various sericulture appliances.
SEC-ZOO-505A-P.3 - To identify silkworm diseases.
SEC-ZOO-505A-P.4 - To demonstrate sericulture techniques.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-505A-P.1	1			2		1							3	3	3
SEC-ZOO-505A-P.2	3			2		1							3	3	3
SEC-ZOO-505A-P.3	1			2		1							3	3	3
SEC-ZOO-505A-P.4	2			2		1							3	3	3

Course Content :

Sl. No.	**Topics**
1	Study of Life cycle of Bombyxmori
II	Study of Pests of silkworm (Uzi fly, dermestid beetles and vertebrates)
III	Study of silkworm diseases (Protozoan, viral, fungal and bacterial)
IV	Study of appliances/equipments of Sericulture
V	Visit to Sericulture unit

Teaching Pedagogy :

Chalk and talk, charts, specimens etc.

Blue print :

Marks / Units	Marks
I	12
II	10
III	04
IV	04
V	05
Total No. of questions	05
Total Marks	**35**

Reference Book :

1. Handbook of Practical Sericulture: Ullal, S.R. and Narasimhanna, M.N. (1987), Central Silk Board Publication, Bengaluru.
2. FAO Manuals on Sericulture : Anonymous (1972), Vol. I-IV
3. Sericulture for Rural Development: Hanumappa (1978), Himalaya Publication
4. The Silkworm, an Important Laboratory Tool : Tazima, Y. (1978), Kodansha Publications, Tokyo

Scheme of Practical Examination

Q. No.1	Identification	12 Marks
Q.No.2	Identification of appliances	10 Marks
Q. No.3	Viva.	04 Marks
Q. No.4	Project submission	05 Marks
Q. No.5	Journal	
	Total	**– 35 Mark**

DEPARTMENT OF ZOOLOGY
Semester-V Skill Enhancement Course-II
Medical Diagnostics SEC-ZOO-505B-T

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 2**

Course objectives :This course will enable the students

1. To know about diagnosis, monitoring, screening and prognosis.
2. To study various diagnostic methods used for analysis of blood and urine
3. To study many infectious, non-infectious diseases and tumors

Course Outcome : On completion of the course, students are able:

SEC-ZOO-505B-T.1 - To describe the composition of the blood.
SEC-ZOO-505B-T.2 - To list various diagnostic methods used for the analysis of blood and urine.
SEC-ZOO-505B-T.3 - To name the types of tumors and their diagnosis.
SEC-ZOO-505B-T.4 - To describe the causes, types and symptoms of Diabetes and Hypertension.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-505B-T.1	1				3	3							3	3	3
SEC-ZOO-505B-T.2	3				3	3							3	3	3
SEC-ZOO-505B-T.3	1				3	3							3	3	3
SEC-ZOO-505B-T.4	1				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Introduction to Medical Diagnostics and its Importance**	**02**
II	**Diagnostics Methods Used for Analysis of Blood and Urine**	
	Blood composition, Preparation of blood smear and Differential Leucocytes Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)Urine Analysis: Physical characteristics; abnormal constituents	05
III	**Diseases**	
	Non-infectious Diseases	
	Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/ Kit/Benedicts test	03
	Infectious Diseases	
	Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis	03
	Tumours	
	Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT scan (using photographs).	02

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	3	1	1	05	21
II	2	2	1	05	24
III	2	2	1	05	24
Total No. of questions	07	05	03	15	69
Total marks	**14**	**25**	**30**		

Reference Book :

1. Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
2. Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II
3. Edition, Bhalani Publishing House Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for
4. Training Courses Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders
5. Robbins and Cortan, Pathologic Basis of Disease, VIIIEdition, Saunders
6. Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.

Semester-V Skill Enhancement Course-II

MODEL QUESTION PAPER (THEORY)

Time: 2.30Hrs **Max Marks: 50**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2	Write a note on / Explain/sketch and label- any three of the following(Out of four)	5X 03 = 15
3	Describe any one of the following (Out of 3)	10X 01 = 10
	Total	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-V Skill Enhancement Course-II Practical
Medical Diagnostics SEC-ZOO-505B-P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 2 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 1**

Course objectives : This course will enable the students

1. To study various diagnostic methods used for analysis of blood and urine
2. To study blood cells and glucose content through glucometer
3. To study medically important diseases such as tuberculosis, hepatitis

Course Outcome : On completion of the course, students are able:

SEC-ZOO-505B-P.1- To analyze the abnormal urine constituents.
SEC-ZOO-505B-P.2- To test blood glucose levels with Glucometer.
SEC-ZOO-505B-P.3- To distinguish blood cells.
SEC-ZOO-505B-P.4- To recognize symptoms of Tuberculosis and Hepatitis.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-505B-P.1	3	2		3		1							3	3	3
SEC-ZOO-505B-P.2	3	2		3		1							3	3	3
SEC-ZOO-505B-P.3	1			3		1							3	3	3
SEC-ZOO-505B-P.4	1			3		1							3	3	3

Course Content:

Sl. No.	**Topics**
1	Urine Analysis: abnormal constituents
II	Study of blood cells (RBC, WBC and platelets)
III	Testing of blood glucose using Glucometer/Kit/Benedicts test.
IV	Tuberculosis and Hepatitis

Teaching Pedagogy :

Chalk and talk, charts, slides, specimens etc.

Blue print :

Marks / Units	Marks
I	12
II	10
III	04
IV	04
V	05
Total No. of questions	05
Total marks	**35**

Reference Book :

1. Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
2. Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II
3. Edition, Bhalani Publishing House Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for
4. Training Courses Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders
5. Robbins and Cortan, Pathologic Basis of Disease, VIIIEdition, Saunders
6. Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S.
7. Chand and Co. Ltd.

Scheme of Practical Examination

Q. No 1	Analysis of given sample.	12 Marks
Q.No2.	Counting of RBC	10 Marks
Q.No.3.	Describe symptoms of----------	04Marks
Q. No 4	Viva	04 Marks
Q. No 5	Journal	05 Marks

DEPARTMENT OF ZOOLOGY
Semester-VI (CBCS)
Reproductive Biology DSE-ZOO-606A-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:3 **Credits : 4**

Course objectives : This course will enable the students

1. To develop and understanding of the anatomy and physiology of the reproductive system.
2. To study the hormonal controls of reproductive organs
3. To gain knowledge about the reproductive health
4. To study complex reproductive processes such as gametogenesis, folliculogenesis etc.

Course Outcome : On completion of the course, students are able:

DSE-ZOO-606A-T .1 - To define the terms Reproduction, Hormones, Spermatogenesis.
DSE-ZOO-606A-T .2 - To differentiate the male and female reproductive systems.
DSE-ZOO-606A-T .3 - To describe the functional anatomy of male and female reproductive system.
DSE-ZOO-606A-T .4 - To name different assisted reproductive techniques.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-606A-T .1	1				3	3							3	3	3
DSE-ZOO-606A-T .2	1				3	3							3	3	3
DSE-ZOO-606A-T .3	1				3	3							3	3	3
DSE-ZOO-606A-T .4	1				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Reproductive Endocrinology** Gonadal hormones and mechanism of hormone action, steroids, glycoprotein hormones, and prostaglandins, hypothalamo – hypophyseal – gonadal axis, regulation of gonadotrophin secretion in male and female; Reproductive System: Development and differentiation of gonads, genital ducts, external genitalia, mechanism of sex differentiation.	12
II	**Functional anatomy of male reproductive system** Outline and histological of male reproductive system in rat and human; Testis: Cellular functions, germ cell, system cell renewal; Spermatogenesis: kinetics and hormonal regulation; Androgen synthesis and metabolism; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract.	12
III	**Functional anatomy of female reproductive system** Outline and histological of female reproductive system in rat and human; Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (rat and human) and their regulation, changes in the female tract; Ovum transport in the fallopian tubes; Sperm transport in the female tract, fertilization	12

IV Hormonal controlof implantation:

Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its regulation 10

V Reproductive Health

Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning 08

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	2	2	1	5	24
II	2	2	1	5	24
III	1	1	1	3	17
IV	1	2	1	4	22
V	1	1	1	3	17
Total No. of questions	07	08	05		104
Total marks	**14**	**40**	**50**	**20**	

Reference Book :

1. Austin, C. R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
2. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
3. Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
4. Hatcher, R.A. etal.The Essentials of Contraceptive Technology. Population Information Programme

B. Sc VI SEMESTER A
MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1 Define/ mention /Give example- any FIVE of the following (Out of 7) 5 X 02 =10
2 Write a note on / Explain/sketch and label- any three of the following(Out of four) 6X 05 = 30
3 Answer / describe in detail any THREE of the following (Out of 5) 10X 03 = 30

DEPARTMENT OF ZOOLOGY
Semester-VI Practical (CBCS)
Reproductive Biology DSE-ZOO-606A-P

Teaching Hours : 3 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 0:0:3 **Credits : 1**

Course objectives : This course will enable the students

1. To study about the set up and maintenance of animal house and the breeding techniques
2. To study how to examine the vaginal smear of rats
3. To study the surgical techniques which are involved in fertilization
4. To study the modern contraceptive devices

Course Outcome : On completion of the course, students are able:

DSE-ZOO-606A-P.1- To construct and maintain animal houses.
DSE-ZOO-606A-P.2- To examine histological sections of reproductive structures.
DSE-ZOO-606A-P.3- To practice cell counting and viability tests of farm bred animals.
DSE-ZOO-606A-P.4- To interpret surgical techniques of endocrinology.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-606A-P.1	2			2		1				2			3	3	3
DSE-ZOO-606A-P.2	1			2		1				2			3	3	3
DSE-ZOO-606A-P.3	2			2		1				2			3	3	3
DSE-ZOO-606A-P.4	1			2		1				2			3	3	3

Course Content :

Sl. No. **Topics**

1 Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.
II Examination of vaginal smear rats from live animals.
III Surgical techniques: principles of surgery in endocrinology. Ovarectomy, hysterectorny, castration and vasectomy in rats.
IV Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
V Human vaginal exfoliate cytology
VI Cell counting and viability test from splenocytes of farm bred animals/celllines.
VII Study of modern contraceptive devices

Teaching Pedagogy :

Chalk and talk, permanent slides, charts, photomicrographsetc.

Blue print :

Marks / Units	Marks
I	06
II	10
III	10
IV	04
V	05
Total No. of questions	05
Total marks	**35**

Reference Book :

1. Austin, C. R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
2. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W. B. Saunders and Company.
3. Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
4. Hatcher, R.A. etal.The Essentials of Contraceptive Technology. Population Information Programme

Scheme of Practical Examination

Q. No 1	Animal House Construction/maintenance	06 Marks
Q. No 2	Caring procedure for Experimental animals	10 Marks
Q.No 3.	Identification of histology slide/Contraceptive devices	10 Marks
Q. No4.	Viva	04 Marks
Q. No 5.	Journal.	05 Marks
	Total –	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-VI (CBCS)
Immunology DSE- ZOO-606B-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:3 **Credits : 4**

Course objectives : This course will enable the students

1. To study about Immune system in human body
2. To study the cells and organs of Immune system
3. To study the properties and functions of Antigens and Antibodies
4. To study the importance of Immune system in health and diseases

Course Outcome : On completion of the course, students are able:

DSE- ZOO-606B-T .1 - To define Immune system, innate and adaptive immunity
DSE- ZOO-606B-T .2 - To discuss the basic properties of Antigens
DSE- ZOO-606B-T .3 - To draw the structure of antibody and state their functions
DSE- ZOO-606B-T .4 - To describe the working of Immune system in human health

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE- ZOO-606B-T.1	1				3	3							3	3	3
DSE- ZOO-606B-T.2	1				3	3							3	3	3
DSE- ZOO-606B-T.3	1				3	3							3	3	3
DSE- ZOO-606B-T.4	1				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Overview of the Immune System :** Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system Cells and Organs of the Immune System :Haematopoeisis, Cells of immune system and organs (primary and secondary lymphoid organs) of the immune system	12
II	**Immunization :** passive and active, adjuvants, vaccines, primary and secondary responses. Basic properties of antigens, B and T cell epitopes, haptens and adjuvants Cellular basis of immunity: T-cells, B-cells and macrophages, their role in antigen recognition, clonal selection, immunological memory. Immunological aspects of viral (HIV), bacterial and parasitic infection.	12
III	**Antigen , Haptens and Adjuvants Antigen capture and presentation to lymphocytes** Antigen recognition in the adaptive immune system Antibodies Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis	12

IV Working of the immune system

Structure and functions of MHC, exogenous and endogenous pathways of antigenpresentation and processing, Basic properties and functions of cytokines, Complement system: Components and pathways. 12

V Immune system in health and disease

Gell and Coombs' classification and brief description of various types ofhypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency, Vaccines: General introduction to vaccines, Various types of vaccines 12

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	2	2	1	5	24
II	2	2	1	5	24
III	1	1	1	3	17
IV	1	2	1	4	22
V	1	1	1	3	17
Total No. of questions	07	08	05	20	104
Total marks	**14**	**40**	**50**		

Reference Book :

1. Kindt, T. J., Goldsby, R. A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company.
2. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition, Mosby, Elsevier Publication.
3. Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology.VEdition.Saunders Publication.

B. Sc VI SEMESTER B

MODEL QUESTION PAPER (THEORY)

Time: 3Hrs **Max Marks: 70**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2	Write a note on / Explain/sketch and label- any three of the following (Out of four)	6X 05 = 30
3	Answer / describe in detail any THREE of the following (Out of 5)	10X 03 = 30

DEPARTMENT OF ZOOLOGY
Semester-VI Practical (CBCS)
Immunology DSE-ZOO-606B-P

Course objectives : This course will enable the students

1. To study about lymphoid organs
2. To study the histology of spleen, thymus and lymph nodes
3. To learn preparing stained blood film to study various types of blood cells
4. To study blood group determination

Course Outcome : On completion of the course, students are able:

DSE-ZOO-606B-P.1 - To prepare stained blood film.
DSE-ZOO-606B-P.2 - To interpret ABO blood group determination.
DSE-ZOO-606B-P.3 - To practice cell counting and viability tests from splenocytes.
DSE-ZOO-606B-P.4 - To identify histological sections of immune system organs.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
DSE-ZOO-606B-P.1	2			2		1							3	3	3
DSE-ZOO-606B-P.2	2			2		1							3	3	3
DSE-ZOO-606B-P.3	2			2		1							3	3	3
DSE-ZOO-606B-P.4	1			2		1							3	3	3

Course Content :

Sl. No. Topics

I Demonstration of lymphoid organs
II Histological study of spleen, thymus and lymph nodes through slides/ photographs
III Preparation of stained blood film to study various types of blood cells
IV Ouchterlony's double immuno-diffusion method.
V ABO blood group determination
VI Cell counting and viability test from splenocytes of farm bred animals/celllines.
VII Demonstration of
a) ELISA
b) Immunoelectrophoresis
(*Subject to UGC guidelines)

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	Marks
I	10
II	04
III	12
IV	04
V	05
Total No. of questions	05
Total marks	**35**

Reference Book :

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company.
2. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition, Mosby, Elsevier Publication.
3. Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology. V Edition. Saunders Publication.

Scheme of Practical Examination

Q. No 1	Preparation of stained blood film for blood cells	10 Marks
Q. No 2	ABO blood group determination.	04 Marks
Q.No 3	Identification of histology slide	12 Marks
Q. No4	Viva.	04 Marks
Q. No 5	Journal	05 Marks
	Total –	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-VI Skill Enhancement Course-I
Research Methodology SEC-ZOO-606A-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 2**

Course objectives :This course will enable the students

1. To study about the foundations of research
2. To understand and study the types of research
3. To understand the need for research design
4. To study the data collection methods

Course Outcome : On completion of the course, students are able:

SEC-ZOO-606A-T.1 - To analyze research data.
SEC-ZOO-606A-T.2 - To construct research models.
SEC-ZOO-606A-T.3 - To practice sampling methods of research.
SEC-ZOO-606A-T.4 - To demonstrate data presentation with digital technology.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-606A-T.1	2				2	3							3	3	3
SEC-ZOO-606A-T.2	2				2	3							3	3	3
SEC-ZOO-606A-T.3	2				2	3							3	3	3
SEC-ZOO-606A-T.4	2				2	3							3	3	3

Course Content :

Units	Contents	Credits
I	**Foundations of Research** Meaning, Objectives, Motivation: Research Methods vsMethodology, Types ofResearch: Analytical vsDescriptive, Quantitative vsQualitative, Basic vsapplied	07
II	**Research Design** Need for research design: Features of good design, important concepts related togood design- Observation and Facts, Prediction and Explanation, Development ofModels. Developing a research plan: Problem identification, Experimentation,Determining experimental and sample designs	07
III	**Data Collection, Analysis and Report Writing** Observation and Collection of Data-Methods of data collection- Sampling Methods, Data Processing and Analysis Strategies, Technical Reports and Thesiswriting, Preparation of Tables and Bibliography. Data Presentation using digitaltechnology	10

IV Ethical Issues

Intellectual property Rights, Commercialization, Copy Right, Royalty, Patent law,Plagiarism, Citation, Acknowledgement 06

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	3	1	1	05	21
II	2	2	1	05	24
III	2	2	1	05	24
Total No. of questions	07	05	03		69
Total marks14	**25**	**30**		**15**	

Reference Book :

1. Anthony, M, Graziano, A.M. and Raulin, M.L. 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Walliman, N. 2011.Research Methods- The Basics. Taylor and Francis, London, New York.
3. Wadhera, B.L.: Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, 2002, Universal Law publishing
4. C.R.Kothari: Research Methodology, New Age International, 2009
5. Coley, S. M. and Scheinberg, C.A. 1990, "Proposal writing". Stage Publication

Semester-VI Skill Enhancement Course-I

MODEL QUESTION PAPER (THEORY)

Time: 2.30Hrs **Max Marks: 50**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2	Write a note on / Explain/sketch and label- any three of the following (Out of four)	5X 03 = 15
3	Describe any one of the following (Out of 3)	10X 01 = 10
	Total	**35 Marks**

DEPARTMENT OF ZOOLOGY

Semester-VI Skill Enhancement Course-I Practical

Research Methodology SEC-ZOO-606A-P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 2 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 1**

Course objectives : This course will enable the students

1. To study different research methods
2. To learn constructing research models
3. To study the methods of data collection
4. To understand the data presentation using technology

Course Outcome : On completion of the course, students are able:

SEC-ZOO-606A-P .1 - To analyze research data.
SEC-ZOO-606A-P .2 - To construct research models.
SEC-ZOO-606A-P .3 - To practice sampling methods of research.
SEC-ZOO-606A-P .4 - To demonstrate data presentation with digital technology.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-606A-P .1		2			3	3				1			3	3	3
SEC-ZOO-606A-P .2	2				3	3				1			3	3	3
SEC-ZOO-606A-P .3	2				3	3				1			3	3	3
SEC-ZOO-606A-P .4	2				3	3				1			3	3	3

Course Content:

Sl. No. Topics

1 Study of different research methods and methodology
II Construction of research models
III Methods of data collection
IV Data Presentation using digital technology

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	Marks
I	12
II	10
III	04
IV	04
V	05
Total No. of questions	05
Total marks	**35**

Reference Book :

1. Anthony, M, Graziano, A.M. and Raulin, M.L. 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Walliman, N. 2011.Research Methods- The Basics. Taylor and Francis, London, New York.
3. Wadhera, B.L.: Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, 2002, Universal Law publishing

Scheme of Practical Examination

Q. No1	Describe research methodology	12 Marks
Q.No2	Explain Construction of research models	10 Marks
Q.No.3	Identify the method of data collection	04Marks
Q. No 3	Viva.	04 Marks
Q. No 4	Journal	05 Marks
	Total	**– 35 Marks**

DEPARTMENT OF ZOOLOGY

Semester-VI Skill Enhancement Course-II

Dairy farming and Technology SEC-ZOO-606B-T

Teaching Hours : 60 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) 4:0:0 **Credits : 2**

Course objectives :This course will enable the students

1. To study different breeds of cattle and their by-products along with their nutritive value
2. To study Dairy products and their management
3. To gain knowledge about the employment and entrepreneur opportunities in Dairy Management

Course Outcome : On completion of the course, students are able:

SEC-ZOO-606B-T.1 - To name different breeds of cattle.
SEC-ZOO-606B-T.2 - To describe the Preparation of Dairy products and quality maintenance.
SEC-ZOO-606B-T.3 - To describe the nutritive value of milk and milk by-products.
SEC-ZOO-606B-T.4 - To list different dairy products and their economical importance.

Mapping of CO with PO and PSO:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	CBZ	CZBT	CZMB
SEC-ZOO-606B-T.1	1				3	3							3	3	3
SEC-ZOO-606B-T.2		2			3	3							3	3	3
SEC-ZOO-606B-T.3	1				3	3							3	3	3
SEC-ZOO-606B-T.4	1				3	3							3	3	3

Course Content :

Units	Contents	Credits
I	Introduction. Breeds of cattle. Breeding and cattle improvement in India. Nutritive value of milk and milk by – products	05
II	Milk Production and Quality of Milk: Quality of Milk. Method for improving milk production factors affecting milk production.	05
III	Dairy Products: Dairy products, Preparation. Quality Assurance.	02
IV	Dairy Management and Entrepreneurship: Dairy book plant management, keeping and accountancy, marketing and logistics management	03

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	2 marks	5 marks	10marks	Total questions	Total marks
I	3	1	1	05	21
II	2	2	1	05	24
III	2	2	1	05	24
Total No. of questions	07	05	03		69
Total marks	**14**	**25**	**30**	**15**	

Reference Book :

1. Cattle Health Handbook: Preventive Care, Disease Treatments & Emergency Procedures for Promoting the Well-Being of Your Beef or Dairy Herd By Heather Smith Thomas
2. Dairy Cattle Management -by W.W. Yapp
3. Principles of Dairy Management Hardcover – by P. V. Rao
4. Dairy Farmer / Entrepreneur Facilitator Guide –Mahendra Publication Pvt Ltd

Semester-VI Skill Enhancement Course-II
MODEL QUESTION PAPER (THEORY)

Time: 2.30Hrs **Max Marks: 50**

Instructions: 1. Answer all the questions.
2. Draw neat and labeled diagram wherever necessary.

1	Define/ mention /Give example- any FIVE of the following (Out of 7)	5 X 02 =10
2	Write a note on / Explain/sketch and label- any three of the following (Out of four)	5X 03 = 15
3	Describe any one of the following (Out of 3)	10X 01 = 10
	Total	**35 Marks**

DEPARTMENT OF ZOOLOGY
Semester-VI Skill Enhancement Course-II Practical
Dairy farming and Technology SEC-ZOO-606B-P

Teaching Hours : 30 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 2:0:0 **Credits : 4**

Course objectives : This course will enable the students

1. To study different breeds of cattle and their by-products along with their nutritive value
2. To study dairy equipments and utilities
3. To learn the testing of quality of milk

Course Outcome : On completion of the course, students are able:

SEC-ZOO-606B-P.1- To recognize different cattle breeds.
SEC-ZOO-606B-P.2- To test the quality of milk.
SEC-ZOO-606B-P.3- To interpret the use of dairy equipments
SEC-ZOO-606B-P.4- To analyze techniques in dairy farming.

Mapping of CO with PO and PSO:

CO	PO										PSO		
	1	2	3	4	5	6	7	8	9	10	CBZ	CZBT	CZMB
1. To recognize different cattle breeds.	1			3		1				1	3	3	3
2. To test the quality of milk.		2		3		1				1	3	3	3
3. To interpret the use of dairy equipments.	3			3		1				1	3	3	3
4. To analyze techniques in dairy farming.		2		3		1				1	3	3	3

Course Content:

Sl. No.	**Topics**
1	Study of Breeds of cattle
II	Study of Dairy Equipment and Utilities
III	Testing of Quality of Milk.
IV	Visit to Dairy farm

Teaching Pedagogy :

Chalk and talk, power point presentation etc.

Blue print :

Marks / Units	Marks
I	12
II	08
III	06
IV	04
V	05
Total No. of questions	05
Total marks	**35**

Reference Book :

1. Cattle Health Handbook: Preventive Care, Disease Treatments & Emergency Procedures for Promoting the Well-Being of Your Beef or Dairy Herd By Heather Smith Thomas
2. Dairy Cattle Management -by W.W. Yapp
3. Principles of Dairy Management Hardcover – by P. V. Rao

Scheme of Practical Examination

Q. No1	Identification of cattle breeds	12 Marks
Q.No2.	Identification and uses of Dairy Equipments	08 Marks
Q.No.3	Project report submission	06Marks
Q. No3	Viva.	04 Marks
Q. No4	Journal	05Marks
	Total	**35 Marks**

DEPARTMENT OF BIOTECHNOLOGY
Semester-V (CBCS)
Molecular Biology and Genetic engineering DSE-BT-505-A-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives : This course (BT) will enable the students to

1. To understand and apply the principles and techniques of molecular biology
2. To make the students to understand the concept of gene, modulation of gene its regulation, modes of transmission and defects
3. To teach the advanced knowledge in a specialized field of molecular and cell biology
4. To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences.
5. To expose students to application of recombinant DNA technology in biotechnological research.
6. To train students in strategizing research methodologies employing genetic engineering techniques.

Course Outcome : After successfully completion of the course, student are able to;

DSE-BT-505-A-T.1- Discuss DNA replication, recombination and repair, transcription and translation
DSE-BT-505-A-T.2- Classify tools and techniques of genetic engineering DNA manipulation enzymes, genome and transcriptome analysis and manipulation tools, gene expression regulation, production and characterization of recombinant proteins.
DSE-BT-505-A-T.3- Explain principles and applications of Polymerase Chain Reaction (PCR).
DSE-BT-505-A-T.4- Illustrate different techniques of DNA sequencing and various tools and techniques of molecular biology.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-505-A-T.1	3	3	2	3	3	2	2	2		2			3	3
DSE-BT-505-A-T.2	3	3	2	3	3	2	2	2		2			3	3
DSE-BT-505-A-T.3	3	3	2	3	3	2	2	2		2			3	3
DSE-BT-505-A-T.4	3	3	2	3	3	2	2	2		2			3	3

Course Content :

Unit I: Molecular Biology

DNA as genetic material: Experiments of Griffith, Avery and Hershey & Chase. Prokaryotic DNA synthesis: Semi conservative replication of DNA, DNA polymerases, Replication forks, replicosome. 10Hrs

Unit II: Concept of gene: Functional units, Eukaryotic and Prokaryotic gene, promoter, introns and exons, Regulation of gene expression in Prokaryotes: Importance of regulation, positive and negative regulation, operon concept-lac.

Transcription : Coding and noncoding strand, RNA polymerase, Initiation of transcription at promoter sites, elongation and termination, inhibitors of transcription. **10Hrs**

Unit III: Genetic code: Deciphering genetic code, major features of genetic code, Wobble hypothesis, universality of genetic code.

Translation: Activation of amino acids, ribosomes, formation of initiation complex, initiation, elongation and termination, fidelity of protein synthesis, inhibitors of protein synthesis **10Hrs**

Unit IV: Genetic Engineering

Importance, history, concepts and developments of genetic engineering

Enzymes-Restriction endonucleases, Nomenclature of restriction endonucleases , types of restriction enzymes, ligases, alkaline phosphatases, polynucleotide kinase, terminal deoxynucleotidyltransferase, S1 nuclease, DNA polymerase, Klenow fragment, Taq DNA polymerase, High fidelity polyrmerases, ribonuclease, reverse transcriptase **10Hrs**

Unit V: Gene cloning vectors: cloning vector- Characteristics and types of vectors,

Expression vector-components, importance of plasmids as cloning vectors, stability of plasmids, examples of plasmid types, different forms of plasmid, plasmids coding for phenotypic traits. Vector map for PUC18, PBR322, Cloning host: E. coli, yeast, plant cells and mammalian cells. **10Hrs**

Unit VI: Recombinant DNA technology: isolation of gene, mRNA, preparation of complementary DNA genomic and cDNA libraries, probes and hybridization.

Genetic engineering techniques: Gel electrophoresis, Agarose gel electrophores, PAGE, Southern and Northern blotting, PCR, Maxam and Gilbert method and Sanger's method of DNA sequencing, Outline of gene transfer methods. **10Hrs**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	DNA as genetic material	10	17	1	1	1	17
2	Concept of gene	10	17	0	1	1	15
3	Genetic code	10	17	1	2	0	12
4	Introduction, importance	10	17	1	0	1	12
5	Gene cloning vectors	10	18	2	2	1	24
6.	Recombinant DNA technology	10	18	2	2	1	24
	Total	**60**	**104**	**7**	**8**	**5**	**104**

MODEL QUESTION PAPER (THEORY)

Time:3Hrs **Max Marks:70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of thefollowing (Out of 7) 5X 2=10
II. Answer / Explain any SIX of the following (Out of 8) 6X 5=30
III. Answer / Describe in detail any THREE of the following (Out of 5) 3X10=30

Reference Book :

1. Brown T.A. 1998 “Genetics – A Molecular Approach” 3rd Edition Stanelythomes Ltd. UK
2. Glick B. R. and Pasternak J. J. 1994 “Molecular Biotechnology Principles and
3. Application of Recombinant DNA “American Society for Microbiology, Washington DC
4. Nicholl D. S. T. 1994 “An Introduction to Genetic Engineering” Cambridge University Press.
5. Watson James.” Recombinant DNA “Scientific American Books, New York.
6. Davis R.W. Botstein D. And Roth J.R. 1980 “A manual for Genetic Engineering”
7. Cold spring Harbor Laboratory, Cold spring Harbor New York.

DEPARTMENT OF BIOTECHNOLOGY
Semester V Praticals CBCS
Molecular Biology and Genetic engineering DSE-BT-505-A-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 04 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 02**

Course objectives :

1. Perform calorimetric estimation of DNA and RNA
2. Determine Tm Value and purity of DNA.
3. Extract and quantify the DNA and linearization of plasmid DNA.
4. Perform Agarose gel electrophoresis and southern blotting.

Practical Course Outcomes (COs):
After completion of this course, students are able to,

DSE-BT-505-A-P.1- Demonstrate the extraction of DNA plant and animal sources and confirmation by Agarose gel electrophoresis method
DSE-BT-505-A-P.2- Demonstrate the Southern blotting
DSE-BT-505-A-P.3- Estimate the DNA and RNA by analytical method
DSE-BT-505-A-P.4- Evaluate the Tm value of DNA and purity of DNA

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-505-1P.1	3	3	3	3	3	1	2	3	1	1			3	3
DSE-BT-505-1P.2	3	3	3	3	3	1	2	3	1	1			3	3
DSE-BT-505-1P.3	3	3	3	3	3	1	2	3	1	1			3	3
DSE-BT-505-1P.4	3	3	3	3	3	1	2	3	1	1			3	3

Practical Course Content :
Molecular Biology

1. Preparation of stock solutions for molecular biology
2. Colorimetric estimation of DNA
3. Colorimetric estimation of RNA
4. Determination of Tm value of DNA
5. Determination of purity of DNA

Genetic engineering

6. Extraction of DNA from plant and animal sources
7. Quantification of DNA by Spectrophotometry
8. Linearization of plasmid DNA (pUC 18 with Sma I)
9. Agarose gel electrophoresis of DNA
10. Southern blotting (demonstration)
11. Gel electrophoresis of circular and linearized plasmid

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (Practical)

Time:02Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major question	12
Q: II	Minor question	08
Q:III	Identify and comment on the given spotters A,B	05
Q:IV	Viva voce	05
Q:V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-V (CBCS)
Immunology and Medical Biotechnology DSE-BT-505-B-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives: This course (BT) will enable the students to

1. To understand and apply the principles and techniques of molecular biology
2. To make the students to understand the concept of gene, modulation of gene its regulation, modes of transmission and defects
3. To teach the advanced knowledge in a specialized field of molecular and cell biology
4. To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences.
5. To expose students to application of recombinant DNA technology in biotechnological research.
6. To train students in strategizing research methodologies employing genetic engineering techniques.

Course Outcome: After successfully completion of the course, student are able to;

DSE-BT-505-B-T.1- Discuss DNA replication, recombination and repair, transcription and translation
DSE-BT-505-B-T.2- Classify tools and techniques of genetic engineering DNA manipulation enzymes, genome and transcriptome analysis and manipulation tools, gene expression regulation, production and characterization of recombinant proteins.
DSE-BT-505-B-T.3- Explain principles and applications of Polymerase Chain Reaction (PCR).
DSE-BT-505-B-T.4- Illustrate different techniques of DNA sequencing and various tools and techniques of molecular biology.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-505-B-T-1	3	3	3	3	3	2	2	3					3	3
DSE-BT-505-B-T-2	3	3	3	3	3	2	2	3					3	3
DSE-BT-505-B-T-3	3	3	3	3	3	2	2	3					3	3
DSE-BT-505-B-T-4	3	3	3	3	3	2	2	3					3	3

Course Content :

Unit I: Molecular Biology

DNA as genetic material: Experiments of Griffith, Avery and Hershey & Chase.

Prokaryotic DNA synthesis: Semi conservative replication of DNA, DNA polymerases, Replication forks, replicosome. **10Hrs**

Unit II: Concept of gene: Functional units, Eukaryotic and Prokaryotic gene, promoter, introns and exons,

Regulation of gene expression in Prokaryotes: Importance of regulation, positive and negative regulation, operon concept-lac.

Transcription: Coding and noncoding strand, RNA polymerase, Initiation of transcription at promoter sites, elongation and termination, inhibitors of transcription. **10Hrs**

Unit III: Genetic code: Deciphering genetic code, major features of genetic code, Wobble hypothesis, universality of genetic code.

Translation : Activation of amino acids, ribosomes, formation of initiation complex, initiation, elongation and termination, fidelity of protein synthesis, inhibitors of protein synthesis **10Hrs**

Unit IV: Genetic Engineering

Importance, history, concepts and developments of genetic engineering

Enzymes-Restriction endonucleases, Nomenclature of restriction endonucleases , types of restriction enzymes, ligases, alkaline phosphatases, polynucleotide kinase, terminal deoxynucleotidyltransferase, S1 nuclease, DNA polymerase, Klenow fragment, Taq DNA polymerase, High fidelity polyrmerases, ribonuclease, reverse transcriptase **10Hrs**

Unit V: Gene cloning vectors: cloning vector- Characteristics and types of vectors,

Expression vector-components, importance of plasmids as cloning vectors, stability of plasmids, examples of plasmid types, different forms of plasmid, plasmids coding for phenotypic traits. Vector map for PUC18,PBR322,

Cloning host: E.coli, yeast, plant cells and mammalian cells. **10Hrs**

Unit VI: Recombinant DNA technology: isolation of gene, mRNA, preparation of complementary DNA genomic and cDNA libraries, probes and hybridization.

Genetic engineering techniques: Gel electrophoresis, Agarose gel electrophores, PAGE, Southern and Northern blotting, PCR ,Maxam and Gilbert method and Sanger's method of DNA sequencing,

Outline of gene transfer methods. **10Hrs**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Historical account, Types of Immunology	10	17	1	1	1	17
2	Immunization	10	17	1	1	1	17
3	Immune disorders	10	17	1	1	1	17
4	History, importance	10	17	1	1	1	17
5	Nucleic acid analysis	10	18	1	1	1	17
6.	Hormone therapy	10	18	2	1	1	19
	Total	**60**	**104**	**7**	**8**	**5**	**104**

MODEL QUESTION PAPER (THEORY)

Time:3Hrs **Max Marks:70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I.	Define/ Write a note on any FIVE of thefollowing (Out of 7)	5 X 2 =10
II.	Answer / Explain any SIX of the following (Out of 8)	6 X 5 = 30
III.	Answer / Describe in detail any THREE of the following (Out of 5)	3 X10 = 30

Reference Book :

1. Brown T.A. 1998 "Genetics – A Molecular Approach" 3rd Edition Stanelythomes Ltd. UK
2. Glick B. R. and Pasternak J. J. 1994 "Molecular Biotechnology Principles and
3. Application of Recombinant DNA "American Society for Microbiology, Washington DC
4. Nicholl D. S. T. 1994 "An Introduction to Genetic Engineering" Cambridge University Press.
5. Watson James." Recombinant DNA "Scientific American Books, New York.
6. Davis R.W. Botstein D. And Roth J.R. 1980 "A manual for Genetic Engineering"
7. Cold spring Harbor Laboratory, Cold spring Harbor New York.

DEPARTMENT OF BIOTECHNOLOGY

Semester V Praticals

Immunology and Medical Biotechnology DSE-BT-505-B-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 04 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 02**

Course objectives :

1. Detect blood group and Rh factor and determine haemoglobin
2. Perform different antigen antibody test and to Calculate the total count of RBC WBC and leucocytes
3. Culture the Antibiotic resistant bacteria and verify it
4. Demonstrate PCR technique.

Practical Course Outcomes (COs):

After completion of this course, students are able to,

DSE-BT-505B-P.1- Demonstrate the blood groups, Rh factor and estimate of hemoglobin content
DSE-BT-505B-P.2- Experiment with the Antigen and antibodies by WIDAL and VDRL test and demonstrate the PCR.
DSE-BT-505B-P.3- Experiment with the Total count of RBC, WBC and Differential Leukocyte count.
DSE-BT-505B-P.4- Experiment with the Culturing of antibiotic resistant strains of bacteria and verification for resistance by Kirby Bauer method

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-505B-P -1	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-505B-P -2	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-505B-P -3	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-505B-P -4	3	3	3	3	3	1	3	3		1			3	3

Practical Course Content:

Immunology

1. Detection of blood groups and Rh factor.
2. Estimation of hemoglobin content of blood.
3. Antigen – Antibody tests WIDAL Test.
4. Antigen – Antibody tests VDRL Test
5. Total count of RBC & WBC.
6. Differential Leukocyte count.
7. Ouchterlony double diffusion
8. Radial Immuno Diffusion

Medical Biotechnology

9. Culturing of antibiotic resistant strains of bacteria
10. verification for resistance by Kirby Bauer method
11. Demonstration of PCR for diagnosis of a disease.

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (Practical)

Time:02Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major question	12
Q: II	Minor question	08
Q:III	Identify and comment on the given spotters A,B	05
Q:IV	Viva voce	05
Q:V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-V SEC (CBCS)
Molecular Biology Techniques SEC-BT-505A-T

Teaching Hours 30 **CIA Marks : 15**
Examination Hours : 3 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course objectives : This course (BT) will enable the students to

1. To understand and apply the principles and techniques of molecular biology
2. To make the students to understand the concept of gene, modulation of gene its regulation, modes of transmission and defects
3. To teach the advanced knowledge in a specialized field of molecular and cell biology
4. To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences.
5. To expose students to application of recombinant DNA technology in biotechnological research.
6. To train students in strategizing research methodologies employing genetic engineering techniques.

Course Outcome : After successfully completion of the course, student are able to;

SEC-BT-505A-T.1- Illustrate the basic principle and techniques to understand the biophysics
SEC-BT-505A-T.2- Identify the physical principles responsible for maintaining the basic cellular function and appraise the importance of various biophysical techniques
SEC-BT-505A-T.3- To illustrate the mechanism of instruments that are used in analytical laboratories.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-505A-T-1	3	3		3	2					1			3	3
SEC-BT-505A-T-2	3	3		3	2					1			3	3
SEC-BT-505A-T-3	3	3		3	2					1			3	3

Course Content :

Unit I:

Recombinant DNA and Molecular probes:

Recombinant DNA: Restriction enzymes for cloning, Technique of restriction mapping, construction of chimeric DNA: cloning in plasmid, Phage and cosmid vectors, hosts for cloning vectors.

Molecular probes: preparation, labelling, amplification, techniques of molecular probing, applications, and Molecular markers. **10 hr**

Unit II:

Gene Analysis and Library Construction;

Gene analysis techniques: Nucleic acid hybridization, Southern and Northern blotting, mapping genes to chromosomes, in situ hybridization, Polymerase chain reaction- Types, RAPD, AFLP, RT-PCR, realtime PCR, microsatellites, applications.

Gene libraries: Construction and screening of genomic and cDNA libraries, chromosome walking, chromosome jumping, BAC libraries. **10 hrs**

Unit III:

Isolation, Sequencing and synthesis of genes:

Isolation of Gene; Isolation of genes for specific proteins, proteins having tissue-specific expressions, isolation of genes using DNA or cDNA probes.

Sequencing of Gene; Sequencing by Maxam and Gilbert's methods, Sanger's dideoxy method, automatic DNA sequencers by PCR, DNA sequencing through transcription, sequencing using DNA chips, sequencing by DE-MALDI-TOFMS.

Gene Synthesis; Gene synthesiser, gene amplification using PCR. **10hrs**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Recombinant DNA and Molecular probes	10	20	4	2	0	18
2	Gene Analysis and Library Construction	08	16	1	1	1	17
3	Isolation, Sequencing and synthesis of genes	12	24	2	2	1	24
	Total	**30**	**59**	**7**	**5**	**2**	**59**

MODEL QUESTION PAPER (THEORY)

Time: 1 : 30 Hr **Max Marks:35**

Instructions: 1. Answer all the questions.

2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 =10

II. Answer / Explain any THREE of the following (Out of 5) 3X 5 = 15

III Answer / Describe in detail any ONE of the following (Out of 2) 1X10 = 10

Reference Book :

1. Molecular Biology of the cell. Alberts, B; Bray, D, Lews, J., Raff, M., Roberts, K and Watson, J.D. Garland publishers, Oxford.
2. Molecular Biology of the Gene - By Watson, Hopkins, Goberts, Steitz and Weiner (Pearson Education)
3. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
4. Gene Structure & Expression - By J.D. Howkins, Publ: Cambridge
5. Test Book of Molecular Biology - By K.S. Sastry, G. Padmanabhan& C. Subramanyan, Publ: Macmillan India.
6. Principles of Gene Manipulation - By R.W. Old & S.B. Primrose, Publ: Blackwell
7. Genes - By B. Lewin - Oxford Univ. Press
8. Molecular Biology &Biotechnol. - By H.D. Kumar, Publ: Vikas
9. Methods for General & Molecular Bacteriology - By P. Gerhardf et al., Publ: ASM
10. Molecular Biotechnology - By G.R. Click and J.J. Pasternak, Publ: Panima
11. Genes and Genomes – By Maxine Singer and Paul Berg

12. Molecular Biology - By D. Freifelder, Publ: Narosa
13. Molecular biology. By;F.Weaver. WCB/McGraw Hill.
14. Gene, Genomics and Genetic Engineering - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications).

DEPARTMENT OF BIOTECHNOLOGY
Semester V Praticals
Molecular Biology Techniques SEC-BT-505-A-P

Teaching Hours : 30 **CIA Marks : 12**
Examination Hours : 03 **SEE Marks : 35**
Scheme (L:T:P) 0:0:2 **Credits : 02**

Course objectives :

1. Extract and purify Plasmid DNA, Bacterial DNA and Human DNA
2. Perform Agarose gel electrophoresis and to extract RNA
3. Extract, Separate and determine the molecular weight of protein.
4. Perform Bacterial transformation and antibiotic sensitivity test for bacteria.

Practical Course Outcomes (COs):
After completion of this course, students are able to,

SEC-BT-505-A-P.1- Demonstrate the extraction and purification of DNA& RNABactria, plant and animal sources and confirmation by Agarose gel electrophoresis method
SEC-BT-505-A-P.2- Demonstrate the extraction and purification ofplasmid DNA
SEC-BT-505-A-P.3- Demonstrate the PCR and Protein separation by SDS-PAGE method
SEC-BT-505-A-P.4- Experiment to perform bacterial Transformation

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-505A-P -1	3	3	3	3	3	1	3	1		1			3	3
SEC-BT-505A-P -2	3	3	3	3	3	1	3	1		1			3	
SEC-BT-505A-P -3	3	3	3	3	3	1	3	1		1			3	3
SEC-BT-505A-P -4	3	3	3	3	3	1	3	1		1			3	3

Practical Course Content :

1. Extraction and purification of genomic DNA from bacteria/plants/animals
2. Extraction and purification of total human DNA
3. Extraction and purification of plasmid DNA
4. Restriction digestion of DNA and Plasmid
5. Agarose gel electrophoresis
6. Quantitation of DNA by spot test assay and uv spectroscopy
7. Isolation of RNA
8. Agarose gel electrophoresis to separate RNA
9. Polymerase Chain Reaction
10. Extraction of proteins
11. Separation of proteins on poly acrylamide gel electrophoresis (page) and
12. determination of molecular weight
13. Bacterial Transformation (Selection of transformants with blue white selection)
14. Antibiotic sensitivity tests for bacter

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc.

Blue Print:

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (Practical)

Time:02Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major question	12
Q: II	Minor question	08
Q:III	Identify and comment on the given spotters A,B	05
Q:IV	Viva voce	05
Q:V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-V SEC (CBCS)
Biophysics and Biochemical techniques SEC-BT-505-B-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 03 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course objectives: This course (BT) will enable the students to

1. The course will help students to acquaint with basic instrumentation, principle and procedure ofvarious sophisticated instruments like Fluorescence microscope, TEM, SEM, HPLC, FACS,GLC and NMR etc.
2. This will enable the students to implement the use of these techniques inbiological research and in discovering new products/compounds

Course Outcome: After successfully completion of the course, student are able to;

SEC-BT-505-B-T.1- Outline the core knowledge base in the theory and practice of basics in Biophysics.
SEC-BT-505-B-T.1- Illustrate the mechanism of instruments that are used in analytical laboratories

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-505-B-T-1	3	3	2	3	3								3	3
SEC-BT-505-B-T-2	3	3	2	3	3								3	3

Course Content :

Unit-I Basic biophysics: Structure of atoms, molecules and chemical bonds Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties). **10 hr**

Unit II

Basic principle of chromatography, principle, procedure and application of- paper chromatography, TLC, Gel permeation chromatography, Ion-exchange chromatography HPLC and GC.

Separation techniques: Homogenization, Membrane filtration and Dialysis, Solvent fractionation, Centrifugation, Electrophoresis-paper electrophoresis, gel electrophoresis, SDS-PAGE, Disc gel, gradient gel, isoelectric focusing,

Spectroscopy –Electromagnetic spectrum, properties of the electromagnetic radiations, Basic principle and applications of Absorption spectroscopy, Colorimeter and UV-visible spectrophotometry, fluorescence spectroscopy, circular dichroism, and NMR **10hr**

Unit III

Microscopy – Light Microscopy: Bright, Dark Field and Phase contrast Microcopy, fluorescence and confocal microscopy. Resolving power and Magnification Electron Microscopy – Working principle, Sample preparation and contrast enhancement techniques. Comparison between SEM, STEM, STM, Atomic force microscopy (AFM). Instrumentation andapplications. **10 hr**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Basic biophysics	10	20	4	2	0	18
2	Basic principle08	16	1	1	1	17	
3	Microscopy	12	24	2	2	1	24
	Total	**30**	**59**	**7**	**5**	**2**	**59**

MODEL QUESTION PAPER (THEORY)

Time: 1 : 30 Hr **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 =10

II. Answer / Explain any THREE of the following (Out of 5) 3X 5 = 15

III Answer / Describe in detail any ONE of the following (Out of 2) 1X10 = 10

Reference Book :

1. Biophysics-Principles and Techniques-M.A. Subramanian, MJP Publishers, Chennai-5.
2. Biophysics- M.V. Volbenshtein, MIR publishers, Moscow,1983.
3. Aspects of Biophysics-William Hughes, John Willey and Sons, N.Y., 1979.
4. Biophysical Science-L.E.Ackermann, L.B.E. Ellis and Williams, 1979.
5. Biophysics-Concepts and Mechanisms-E.J. Casey, Von Nostrand Reinhold co., N.Y., 1962.Affiliated to East-West press, New Delhi.
6. Biochemical Guide to Principles & techniques of Practical Biochemistry - Keith Wilson & Kenneth Goulding, Cambridge Presss.
7. Prnciples& Techniques of Practical Biochemistry - Keith Wilson and John Walker, Cambridge Press.
8. Introduction to Practical Biochemistry - Shawney, Randhir Singh, Narasa Pub, N.Delhi.
9. Analytical Biochemistry - R.B Turner, Elsevier, N.Y.
10. Biomedical Instrumentation - M. Arumugam, Anuradha agencies, Chennai
11. Principles and Techniques of Practical Biochemistry-Bryan L. Williams & Keith Wilson, Cambridge Univ. Press.
12. Instrumental Methods of Analysis-Chatwal &Anand, Himalayan Publication.

DEPARTMENT OF BIOTECHNOLOGY
Semester-V SEC Praticals (CBCS)
Biophysics and Biochemical techniques SEC-BT-505-B-P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 03 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course objectives : This course (BT) will enable the students to

1. The course will help students to acquaint with basic instrumentation, principle and procedure of various sophisticated instruments like Fluorescence microscope, TEM, SEM, HPLC, FACS,GLC and NMR etc.
2. This will enable the students to implement the use of these techniques inbiological research and in discovering new products/compounds

Course Outcome : After successfully completion of the course, student are able to;

SEC-BT-505-B-P.1- Examine pH of biological samples
SEC-BT-505-B-P.2- Preparation of Buffers and Identification of amino acid, lipid and Separation of plant pigments by circular different chromatography methods

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-505-B-P.1	3	3	2	3	3								3	3
SEC-BT-505-B-P.2	3	3	2	3	3								3	3

Course Content :

1. Determination of surface tension and viscosity of water and body fluids (plasma, blood and C.S F.)
2. Determination of pH of biological samples (blood, plasma, urine, saliva), phosphate buffer by glass electrode.
3. Preparation of Buffers: Phosphate buffer, Tris buffer and Citrate buffer.
4. Identification of amino acid by circular paper chromatography.
5. Ascending paper chromatography of amino acids.
6. Separation of plant pigments by column chromatography using silica gel-G.
7. Demonstration of separation of lipids by TLC.
8. Demonstration of two dimensional chromatography of amino acids
9. Demonstration on polyacrylamide gel electrophoresis[PAGE] of proteins

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print:

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (Practical)

Time:02Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major question	12
Q: II	Minor question	08
Q:III	Identify and comment on the given spotters A,B	05
Q:IV	Viva voce	05
Q:V	Journal	05

Reference Book :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-VI (CBCS)

MICROBIAL TECHNOLOGY AND AGRICULTURAL BIOTECHNOLOGY DSE-BT-606A-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives: This course (BT) will enable the students to

1. Aquire the knowledge to use microorganism for the microbial production.
2. Describe the role of biotechnologies in food production, food processing, and food security
3. Summarize the methods used to produce transgenic plants, and explain the selection processes for identifying transformed plant cells
4. Describe the role that Agrobacterium tumefaciens plays in producing genetically modified plant crops
5. Discuss how proteins of interest may be purified from plant samples and how DNA or protein samples may be assayed for their concentration and purity.

Course Outcome : After successfully completion of the course, student are able to;

DSE-BT-606A-T.1- Outline the importance of biotechnological important microorganism their metabolic pathway involved in microbial products and microbial production.
DSE-BT-606A-T.2- Explain the Kinetics of microbial growth, product formation kinetics and Microbial bio pesticides
DSE-BT-606A-T.3- Explain plant microbe's interactions especially rhizosphere, phyllosphere and mycorrhizae and their applications
DSE-BT-606A-T.4- DemonstrateGenetic engineering techniques for production of crop improvement
DSE-BT-606A-T.5- Discuss the basic of food biotechnology in food processing, fruit repiening, dairy industry and role of genetically modified foods.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-606A-T.1	3	3	3	3	3		2	3	3	2			3	3
DSE-BT-606A-T.2	3	3	3	3	3		2	3	3	2			3	3
DSE-BT-606A-T.3	3	3	3	3	3		2	3	3	2			3	3
DSE-BT-606A-T.4	3	3	3	3	3		2	3	3	2			3	3
DSE-BT-606A-T.5	3	3	3	3	3		2	3	3	2			3	3

Course Content :

Unit 1. Microbial Technology

Introduction to biotechnological importance of microorganisms

Metabolic pathways involved in microbial products, primary and secondary metabolites, enzymes and microbial 00 000000biomass-single cell proteins and their applications

Microbial production: Production of vitamins, enzymes, organic acids, aminoacids, polysaccharides, colorants, flavors, emulsifiers, proteins, lipids and antibiotics. Process for production of Vit-C and Penicillin **10Hrs**

Unit 2.

Kinetics of microbial growth and product formation: Phase of cell growth in batch cultures and continuous culture. Growth associated (primary) and non-growth associated (secondary) product formation kinetics, Leudeking-piert models, substrate and product inhibition on cell growth and product formation, Introduction to structured models for growth and product formation **10Hrs**

Unit 3.

Microbial biocides, pesticides: Fungicides and herbicides. Bacterial, fungal and viral bioagents- Bacillus thuringensis (Bt), Beauveriabassiana, baculoviruses. Mechanism of biological control of plant diseases – induced resistance, systemic acquired resistance, hypovirulence, competition, antibiosis, mycoparasitism. **10Hrs**

Unit 4.

Agricultural Biotechnology

Introduction: Conventional crop improvement techniques and their limitations, biotechnology for crop improvement, future prospects of biotechnology for agriculture.Biological nitrogen fixation: Nitrogen fixing microorganisms, structure of nitrogenase, role of nitrogenase, genetics of nitrogen fixation, nif gene organization, regulation of nif gene expression. **10Hrs**

Unit 5.

Genetic engineering of crop plants: Gene transfer techniques for desirable traits in crop .Plants Agrobacterium mediated gene transfer, Direct gene transfer to protoplasts, Biolistic gene transfer, Few examples of transgenic plants obtained through gene transfer techniques- Bt- cotton, herbicide tolerant soybean, virus resistance (Papaya ringspot). **10Hrs**

Unit 6.

Food biotechnology: Food processing- biotechnological approaches, Fruit ripening and its manipulation, role of ACC synthase, genetically modified foods, transgenic fish, biotechnology in dairy industry **10Hrs**

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Introduction to biotechnological	10	17	1	1	1	17
2	Kinetics of microbial growth and product formation	10	17	1	1	1	17
3	Microbial biocides, pesticides	10	17	1	1	1	17
4	Introduction 10	17	1	1	1	17	
5	Genetic engineering of crop plants	10	18	2	1	1	19
6.	Food biotechnology	10	18	1	1	1	17
	Total	**60**	**104**	**7**	**8**	**5**	**104**

MODEL QUESTION PAPER (THEORY)

Time:3Hrs **Max Marks:70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of thefollowing (Out of 7) 5 X 2 =10
II. Answer / Explain any SIX of the following (Out of 8) 6 X 5 = 30
III. Answer / Describe in detail any THREE of the following (Out of 5) 3 X10 = 30

Reference Book :

1. Aneja K. R., Experiments in Microbiology Plant Pathology and Biotechnology, 4th edition, 2007, New Age International (P) Limited Publishers
2. Bhojwani S. S. and Razda, Plant Tissue Culture Theory and Practice, 2008 North Holland
3. Chawla H. S. Introduction to Plant Biotechnology 2002, Oxford University Press New Delhi.
4. Dubey R. C., A Textbook of Biotechnology, 2009, S. Chand & Company , New Delhi
5. Geetha S & Others Agricultural Biotechnology, 2008, Agrobios (India)
6. Gupta P. K. Elements of Biotechnology, 1998, Rastogi Publications, Meerut
7. Jogadand S. N. Medical Biotechnology, 2005, Himalaya Publishing House
8. Abbas A. K. and Others, Cellular and Molecular Immunology 6th edition, 2008, Elesevier India Pvt. Ltd.

DEPARTMENT OF BIOTECHNOLOGY
Semester-VI Praticals (CBCS)
MICROBIAL TECHNOLOGY AND AGRICULTURAL BIOTECHNOLOGY DSE-BT-606A-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 04 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 02**

Course objectives : This course (BT) will enable the students to

1. Identify and isolate the important microorganisms in the field of agriculture.
2. Prepare wine and commercial microbial products.

Practical Course Outcomes (COs):
After completion of this course, students are able to,

DSE-BT-606A-P.1- Identification and isolation of important microorganisms
DSE-BT-606A-P.2- Demonstration of commercial microbial products.
DSE-BT-606A-P.3- Prepare Wine and Entrapment of yeast for enzyme production.
DSE-BT-606A-P.4- Visit to biotechnology related industries and institutions

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-606A-P.1	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-606A-P.2	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-606A-P.3	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-606A-P.4	3	3	3	3	3	1	3	3		1			3	3

Practical Course Content:

1. Identification of important microorganisms relevant to biotechnology: E. coli, Saccharomyces cerevisiae, Spirulina.
2. Isolation and Study of Rhizobium from legume root nodules (Gram staining)
3. Isolation of Azobotacter (Using Ashby's manitol agar)
4. Isolation of Azospirillum(BTB Medium)
5. Isolation of phosphate solubilizing bacteria and estimation of phosphate
6. Demonstration of commercial microbial products – single cell proteins, microbial flavours
7. Entrapment of yeast for enzyme production
8. Preparation of wine
9. Test on in vitro antagonism
10. Visit to biotechnology related industries and institutions

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (PRACTICAL)

Time:04 Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major Question.	12
Q: II	Minor Question	08
Q:III	Identify and comment on the given spotters	05
Q:IV	Viva voce	05
Q:V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-VI (CBCS)
Environmental Biotechnology And Bioinformatics DSE-BT-606-B-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) 4:0:0 **Credits : 4**

Course objectives : This course (BT) will enable the students to

1. To impart an introductory knowledge about the subject of Bioinformatics to the students studying any discipline of science.
2. To understand the usage of advanced techniques in Bioinformatics.
3. To impart an introductory knowledge about the Environmental Biotechnology.
4. To understand the concepts of bioremediation, renewable and non renewable source and Treatment of Industrial wastes.

Course Outcome: After successfully completion of the course, student are able to;

DSE-BT-606-B-T.1- Outline the basic concepts of Bioinformatics, interenet and DNA databases and use them effectively and able to annote the sequence with the software tools.
DSE-BT-606-B-T.2- Demonstrate how to retrieve the information from different databases.
DSE-BT-606-B-T.3- Summarize the predictive methods using protein sequence.
DSE-BT-606-B-T.4- Explain role of biotechnology to solve the environmental problems.
DSE-BT-606-B-T.5- Illustrate the Degradation of xenobiotics by microorganisms and industrial waste management techniques.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1(CZBT)**	**2(CBBT)**
DSE-BT-606-B-T.1	3	3		3	3	2	1		3	2			3	3
DSE-BT-606-B-T.2	3	3		3	3	2	1		3	2			3	3
DSE-BT-606-B-T.3	3	3		3	3	2	1		3	2			3	3
DSE-BT-606-B-T.4	3	3		3	3	2	1		3	2			3	3
DSE-BT-606-B-T.5	3	3		3	3	2	1		3	2			3	3

Course Content :

Bioinformatics

Unit I: **10 hrs**

Bioinformatics and the internet: Introduction, internet basics, connecting to the internet, electronic mail, File transfer protocol, the World Wide Web.

DNA databases, Genbank, EMBL, DDBJ, protein sequence databases, PIR- PSD, SWISSPROT, dendrograms, gene families phylogenetic and mutation studies databases, literature databases (searching and downloading).

Unit II: **10 hrs**

Information retrieval from databases: Database similarity searching, FASTA, BLAST search, sequence alignment global alignment, local alignment, sequence aligning ClustalW, ClustalX, DIALIGN2, Multalin, Navigating the NCBI website OMIM, PubMed.

proteomics, protein

Identity based on composition, physical properties based on sequence, motifs and patterns, secondary structure and folding classes, special structures or features, tertiary structure

Unit III: **10 hrs**

Predictive methods using protein sequences

Genomics: genome analysis, bacterial genome sequence project, Human Genome Project Microarray technologies: Expression, Profiles and protein functions and applications.

Environmental Biotechnology

Unit IV: **10 hrs**

Introduction: Major issues in environmental pollution – role of biotechnology to solve the problems. Biotechnological methods of pollution detection: general bioassay, cell biological methods, immunoassays, DNA-based methods, use of biosensors.

Biotechnological methods in pollution abatement: Reduction of CO_2 emission. Waste water treatment – conventional wastewater treatment, use of algae, Bioreactors for waste-water treatment, eutrophication, use of cell immobilization

Unit V: **10 hrs**

Renewable and non-renewable resources; current status of biotechnology in environment protection.

Bioremediation: Concepts and principles, bioremediation using microbes, in situ and ex situ bioremediation, biosorption and bioaccumulation of heavy metals.

Xenobiotics: Degradation by microorganisms with reference to pesticides, herbicides, polyaromatic hydrocarbons. Renewable energy: Relevance of GMO to the environment.

Solid waste management: Waste as a source of energy, biotechnology in paper and pulp industry, production of oil and fuels from wood waste, anaerobic and aerobic composting, vermiculture, biofuels.

Biotechnology and Biodegradation: Degradation of xenobiotic compounds- Simple, aromatic, chlorinated, poly aromatic, petroleum products, pesticides and surfactants.

Biohydrometallurgy and biomining: Bioleaching, biosorption, oil degradation, creation of superbug.

Unit VI: **10 hrs**

Treatment of Industrial wastes: Dairy, pulp, dye, leather and pharmaceutical industries. Solid waste management. Genetically engineered microbes for waste treatment Ecofriendly bioproducts: Biomass resources, Biogas, alcohol as fuel, biological hydrogen generation, biodegradable plastics.

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Bioinformatics and the internet	10	17	1	1	1	17
2	Information retrieval from databases	10	17	1	1	1	17
3	Predictive methods using protein sequences	10	17	1	1	1	17
4	Introduction	10	17	1	1	1	17
5	Renewable and non-renewable resources	10	18	2	1	1	19
6.	Treatment of Industrial wastes	10	18	1	1	1	17
	Total	**60**	**104**	**7**	**8**	**5**	**104**

MODEL QUESTION PAPER (THEORY)

Time:3Hrs **Max Marks:70**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 =10

II. Answer / Explain any SIX of the following (Out of 8) 6 X 5 = 30

III. Answer / Describe in detail any THREE of the following (Out of 5) 3 X10 = 30

Reference Book :

1. Aneja K. R., Experiments in Microbiology Plant Pathology and Biotechnology, 4th edition, 2007, New Age International (P) Limited Publishers
2. Bhojwani S. S. and Razda, Plant Tissue Culture Theory and Practice, 2008 North Holland
3. Chawla H. S. Introduction to Plant Biotechnology 2002, Oxford University Press New Delhi.
4. Dubey R. C., A Textbook of Biotechnology, 2009, S. Chand & Company , New Delhi
5. Geetha S & Others Agricultural Biotechnology, 2008, Agrobios (India)
6. Gupta P. K. Elements of Biotechnology, 1998, Rastogi Publications, Meerut
7. Jogadand S. N. Medical Biotechnology, 2005, Himalaya Publishing House
8. Abbas A. K. and Others, Cellular and Molecular Immunology 6th edition, 2008, Elesevier India Pvt. Ltd.

DEPARTMENT OF BIOTECHNOLOGY
Semester VI Praticals CBCS
Environmental Biotechnology And Bioinformatics DSE-BT-606-B-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 04 **SEE Marks : 35**
Scheme (L:T:P) 0:0:4 **Credits : 02**

Course objectives :

1. Observe root nodules and prepare Bioferilizers
2. Analyse sewage water for BOD, toxic chemicals and microbial flora.
3. Study different different biological database and do primer designing.

Practical Course Outcomes (COs):

After completion of this course, students are able to,

DSE-BT-606B-P.1- Make use of microbial culture for seed and root inoculation.
DSE-BT-606B-P.2- Prepare and formulate Biofertilizer and bio control formulations.
DSE-BT-606B-P.3- Analyze sewage samples.
DSE-BT-606B-P.4- Design the primer and construct databases using different bioinformatics tools.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
DSE-BT-606B- P.1	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-606B- P.2	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-606B- P3	3	3	3	3	3	1	3	3		1			3	3
DSE-BT-606B- P.4	3	3	3	3	3	1	3	3		1			3	3

Practical Course Content:

1. Seed inoculation with Rhizobium culture and observation for root nodulation
2. Photographic demonstration of transgenic crop plants/animals and agriculture biotechnology innovations
3. Preparation of bio control formulations
4. Biofertilizer formulation
5. Analysis of sewage water for BOD
6. Analysis of sewage water for Toxic chemicals
7. Analysis of sewage water for Microbial flora
8. Study of different online Databases- PubMet, GenBank, PDB.
9. Sequence Similarity Search- FASTA and BLASTA.
10. Multiple sequence alignment-CLUSTA, OMEGA.
11. Primer Designing
12. Visit to National Bioinformatics Centre

Teaching Pedagogy:

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (PRACTICAL)

Time:04 Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major Question.	12
Q: II	Minor Question	08
Q:III	Identify and comment on the given spotters	05
Q:IV	Viva voce	05
Q:V	Journal	05

References :

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-VI SEC (CBCS)
Intellectual Property Rights SEC-BT-606A-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 03 **SEE Marks : 35**
Scheme (L:T:P) 2:0:0 **Credits : 02**

Course objectives : This course (BT) will enable the students to

1. To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights.
2. To identify the significance of practice and procedure of Patents.
3. To make the students to understand the statutory provisions of different forms of IPRs in simple forms.
4. To learn the procedure of obtaining Patents, Copyrights, Trade Marks &Industrial Design
5. To enable the students to keep their IP rights alive

Course Outcome : After successfully completion of the course, student are able to;

SEC-BT-606A-T.1- Outline the introduction and the need for intellectual property right (IPR) IPR in India.
SEC-BT-606A-T.2- Discuss Emerging issues in Intellectual property related to biotechnology.
SEC-BT-606A-T.3- Design the scheme in Entrepreneurship in bio-business.

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-606A-T.1	3	3	3	3	3		3	3	3	3				
SEC-BT-606A-T.2	3	3	3	3	3		3	3	3	3				
SEC-BT-606A-T.3	3	3	3	3	3		3	3	3	3				

Course Content:

Unit I **10 hrs**

Overview of intellectual property; Introduction and the need for intellectual property right (IPR) IPR in India – Genesis and Development of IPR in abroad. Some important examples of IPR. Definition of copyright, patents, trade marks, geographical indications, industrial designs and biological inventions

Unit II **10 hrs**

Enforcement of Intellectual property rights; Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property; Overview of Biotechnology and Intellectual Property Biotechnology Research and

Intellectual Property Rights Management Licensing and Enforcing Intellectual Property Commercializing Biotechnology Invention

Unfair competation; What is unfair competition? relationship between unfair competition and intellectual property laws?

Unit III **10 hrs**

Entrepreneurship in bio-business:

Introduction and scope in Bio-entrepreneurship, Types of bio-industries Entrepreneurship development programs of public and private agencies (MSME, DBT, BIRAC, Make In India), Negotiating the road from lab to the market (strategies and processes of negotiation with financiers, government and regulatory authorities), Business

plan preparation including statutory and legal requirements, Technology – assessment, development & Upgradation.

Teaching Pedagogy :

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	Overview of intellectual property	10	20	4	2	0	18
2	Enforcement of Intellectual property rights	08	16	1	1	1	17
3	Entrepreneurship in bio-business	12	24	2	2	1	24
	Total	**30**	**59**	**7**	**5**	**2**	**59**

MODEL QUESTION PAPER (THEORY)

Time: 1 Hr 30 min **Max Marks:35**

Instructions: 1. Answer all the questions.

2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 =10

II. Answer / Explain any THREE of the following (Out of 5) 3X 5 = 15

III. Answer / Describe in detail any ONE of the following (Out of 2) 1X10 = 10

Reference Book :

1. An Introduction to Ethical, Safety and Intellectual Property Rights Issues in Biotechnology" by Padma Nambisan
2. IPR, Biosafety and Bioethics" by Goel and Parashar
3. Genetically Modified Crops and Agricultural Development (Palgrave Studies in Agricultural
4. Economics and Food Policy)" by MatinQaim
5. Biosafety and Bioethics" by Rajmohan Joshi
6. Bioethics and Biosafety in Biotechnology" by V Sree Krishna
7. Biotechnology, IPRs and Biodiversity - By M.B. Rao and Manjula Guru (Pearson Education)
8. Text Book of Biotechnology- By H.K. Das (Wiley Publications)
9. Biotechnology-By H.J. Rehm and G. Reed. VIH Publications, Germany

DEPARTMENT OF BIOTECHNOLOGY
Semester VI SEC Praticals
Intellectual Property Rights SEC-BT-606A-P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours 03 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:2 **Credits : 02**

Course objectives:

1. Case study the patenting, Bio-piracy and Human cloning
2. Prepare of report and presentation.

Practical Course Outcomes (COs):

After completion of this course, students are able to,

SEC-BT-606A-P.1- Design the Case studies of Patenting of biotechnological in inventions related to life forms.
SEC-BT-606A-P.2- Design the Case studies of human cloning and traditional knowledge bio-piracy
SEC-BT-606A-P.3- Evaluation of report and its interpretations

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-606A- P.1	3	3	3	3	3	1	3		2	1			3	3
SEC-BT-606A- P.2	3	3	3	3	3	1	3		2	1			3	3
SEC-BT-606A- P.3	3	3	3	3	3	1	3		2	1			3	3

Practical Course Content:

1. Case studies of Patenting of biotechnological in inventions related to life forms
2. Case studies of human cloning
3. Case studies of traditional knowledge bio-piracy
4. Preparation of report and presentation.

Teaching Pedagogy:

Demonstration, Hands on training, Videos, etc.

Blue Print :

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (Practical)

Time:02Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major question	12
Q: II	Minor question	08
Q:III	Identify and comment on the given spotters A,B	05
Q:IV	Viva voce	05
Q:V	Journal	05

References:

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF BIOTECHNOLOGY
Semester-VI SEC (CBCS)
Fermentation Technology SEC-BT-606B-T

Course objectives: This course (BT) will enable the students to

1. This course introduces various aspects of applied and industrial microbiology.
2. The course helps the students to learn every important upstream and downstream components of fermentation process including strain selection, development, media design, formulation and recovery of products.
3. Additionally, the course can educate the students about fermenter design, different types of fermentations and also the current trend of fermentation process in biotech-industry.
4. Overall, the course helps in the student's exposure on industrial applications of bioprocesses.

Course Outcome: After successfully completion of the course, student are able to;

SEC-BT-606B-T.1- Outline the scope, types and design the fermentor, in fermentation technology.
SEC-BT-606B-T.2- Explain the Types of Fermentation Process, Transport phenomena in bioprocess, Categories of fermentation Technology and current trend of fermentation process in biotech-industry.
SEC-BT-606B-T.3- Summarize the Downstream processing of biological

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-606B-T.1	3	3	3	3	3	2		3		1			3	3
SEC-BT-606B-T.2	3	3	3	3	3	2		3		1			3	3
SEC-BT-606B-T.3	3	3	3	3	3	2		3		1			3	3

Course Content:

Unit I **10 hrs**

General introduction: History and Scope of Fermentation Technology. Fermentation Methodology.
Types of Fermentors; External Recycle Airlift fermentor, Internal recucle airlift fermenters, Tubular Tower fermentor, Nathan Fermentor, Stirred Fermentor
Design of bioreactors, control systems, operation, optimization, control and monitoring of variables such as temperature, agitation, pressure, pH, online measurements and control, useof biosensors in bioreactors.

Unit II **10hrs**

Types of Fermentation Process; Batch, Fed Batch and Continuous.
Transport phenomena in bioprocess; Scale up of bioreactors, mass transfer resistance, oxygen transfer coefficients, biological heat transfer, heat transfer coefficients.
Categories of fermentation Technology; Microbial biomass production, Microbial metabolite production- Primary and secondary, Microbial enzymes, Bioconversion and biotransformation with two examples each

Unit III **10 hrs**

Downstream processing of biologicals: Separation of cells, foam separation, flocculation, filtration, centrifugation, mechanical and non-mechanical methods, membrane filtration, ultra filtration and reverse osmosis, chromatographic techniques, absorption, spray drier, drum dryers, freeze dryers.

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

	Name of the topics	Teaching hours	Marks per unit	2 marks	5 marks	10 marks	Total marks
1	General introduction	10	20	4	2	0	18
2	Types of Fermentation Process	08	16	1	1	1	17
3	Downstream processing of biologicals	12	24	2	2	1	24
	Total	**30**	**59**	**7**	**5**	**2**	**59**

MODEL QUESTION PAPER (THEORY)

Time: 1 Hr 30 min **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

I. Define/ Write a note on any FIVE of the following (Out of 7) 5 X 2 =10

II. Answer / Explain any THREE of the following (Out of 5) 3X 5 = 15

III. Answer / Describe in detail any ONE of the following (Out of 2) 1X10 = 10

Reference Books

1. A. H. Patel. (1985), Industrial Microbiology, Macmillan India Ltd.
2. Bioreactor Design and Product Yield (1992), BIOTOL series, Butterworths Heinemann.
3. Casida, L. E., (1984), Industrial Microbiology, Wiley Easterbs, New Delhi
4. Dilip K. Arora editor, Fungal Biotechnology in agriculture, food and environmental applications (Mycology), 2005. Marcel Dekker, Inc. New York. Basel
5. Indian Pharmacopia and British Pharmacopia (Latest Edn).
6. Lydersen B., N. a. D' Elia and K. M. Nelson (Eds.) (1993) Bioprocess Engineering: Syatems, Equipment and Facilities, John Wiley and Sons Inc.
7. Operational Modes of Bioreactors, (1992) BIOTOL series, Butterworths Heinemann.
8. Peppler, H. L (1979), Microbial Technology, Vol I and II, Academic Press, New York.
9. Peter F. Stanbury. Principles Of Fermentation Technology, 2E, Elsevier (A Division of Reed Elsevier India Pvt. Limited), 2009
10. Prescott, S.C. and Dunn, C. G., (1983) Industrial Microbiology, Reed G. AVI tech books.
11. Reed G. Ed. Prescott and Dunn's Industrial Microbiology. 4th Ed., CBS Pub. New Delhi.
12. Shuichi and Aiba. Biochemical Engineering. Academic Press. 1982.
13. Stanbury, P. F. and Whittaker, A. (1984) Principles of Fermentation technology, Pergamon press.
14. Sudhir U. Meshram, Ganghdhar B Shinde, Applied biotechnology. I.K. International Pvt.Ltd. 2009

DEPARTMENT OF BIOTECHNOLOGY
Semester VI SEC Praticals
Fermentation Technology SEC-BT-606B-P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 03 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:2 **Credits : 02**

Course objectives:

1. Demonstrate the parts of typical fermentor
2. Isolate Organic acid producing, enzyme producing and antibiotic producing bacteria.
3. Ferment produce and, estimate enzymes, organic acids and alcohol.

Practical Course Outcomes (COs):

After completion of this course, students are able to,

SEC- BT -606B-P.1- Demonstration of typical fermenter.
SEC- BT -606B-P.2- Preparation of industrial important microbial products.
SEC- BT -606B-P.3- Productions of various fermentation products and its estimation

Mapping of CO with PO and PSO:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1(CZBT)	2(CBBT)
SEC-BT-606B-P.1	3	3	3	3	3	1	3			1			3	3
SEC-BT-606B-P.2	3	3	3	3	3	1	3			1			3	3
SEC-BT-606B-P.3	3	3	3	3	3	1	3			1			3	3

Practical Course Content:

1. Demonstration of different parts of a typical fermenter.
2. Isolation of antibiotic producing microorganisms from soil
3. Isolation of enzyme producing microorganisms from soil
4. Isolation of organic acid producing microorganisms from soil
5. Microbial fermentations for the production and estimation of Enzyme: Amylase
6. Microbial fermentations for the production and estimation ofAmino acid: Glutamicacid
7. Microbial fermentations for the production and estimation ofAlcohol:Ethanol

Teaching Pedagogy :

Demonstration, Hands on training, Videos, etc.

Blue Print:

Sl.No	Particulars	Marks
1.	Experimental Skills	08
2.	Principle/Introduction/Mechanism	05
3.	Diagram/Observation	04
4.	Result	03
5.	Viva voce	05
6.	Journal	05

MODEL QUESTION PAPER (Practical)

Time:02Hrs **Max Marks:35**

Instructions: 1. Answer all the questions.
2. Draw the neat and labeled diagrams wherever necessary.

Q: I	Major question	12
Q: II	Minor question	08
Q:III	Identify and comment on the given spotters A,B	05
Q:IV	Viva voce	05
Q:V	Journal	05

References:

1. Laboratory Manual of Microbiology
2. Laboratory Manual of Biotechnology
3. K.R. Aneja. 2012, Experiments in Microbiology , Plant pathology and Biotechnology- 4th Edition.
4. Dr. S Rajan and Mrs. R Selvi Christy. 2011, Experimental Procedures in Life Science, 1st Edition.
5. S Sadasivam A Manickam, Biochemical Methods

DEPARTMENT OF ELECTRONICS

Semester-V

Signals And Systems DSE –ELE-505A-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) : 4:0:0 **Credits : 4**

Course objectives: This course (DSE –ELE-505A-T) will enable the students to

1. To study the signals using mathematical concepts and to understand the how toperform mathematical signals on signals
2. Familiar with commonly used signals such as the unit step,ramp ,impulse function,sinusoida signals and complex exponential.

Course Outcome: After successful completion of the course, students are able to;

DSE–ELE-505A-T.1 - Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.

DSE –ELE-505A-T.2 -. Analyze the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis

DSE –ELE-505A-T.3 - To discuss and classify systems based on their properties and determine the response of LSI system using convolution

DSE –ELE-505A-T.4 -. Analyze system properties based on impulse response and Fourier analysis

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE–ELE-505A-T.1	3	2	3	1	2	1	3	-	3	3	3
DSE–ELE-505A-T.2	3	2	3	1	2	2	3	-	2	3	3
DSE–ELE-505A-T 3	3	2	3	1	2	1	3	-	2	3	3
DSE–ELE-505A-T.4	3	2	3	1	2	1	2	-	2	3	3

Course Content

UNIT I: SIGNALS AND SYSTEMS

Introduction, Definition of signal. Definition of system Elementary continuous –time signals. Elementary Discrete – time signals. Basic operations on signals. Classification of signals. System viewed as Interconnection of operations. Properties of system

UNIT II: TIME – DOMAIN REPRESENTATION FOR LTI SYSTEMS

Introduction, Impulse response representations for LTI systems. Properties of impulse response representations for LTI systems. Differential/ difference equation representations for LTI systems. Block diagram representations.

UNIT-III :Fourier representation of signals

Introduction ,Fourier representations for signal classes ,orthogonolity of sinusoidal signals , Discrete time periodic signals,continous time periodic signals ,discrete time non periodoic signals and continous time non periodic signals.

UNIT-IV :Laplace Transform:

Laplace Transform, Inverse Laplace Transform, Properties of the Laplace Transform, Laplace Transform Pairs, Laplace Transform for signals, Laplace Transform Methods in Circuit Analysis, Impulse and Step response of RL, RC and RLC circuits

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	Signals And Systems	15	24	2T	1T/1P	1T	24
II	Time – Domain Representation For Lti Systems	15	24	2T	1T/1P	1T	24
III	Fourier Representation of Signals	15	32	1T	1T/1P	2T	32
IV	Laplace Transform	15	24	2T	1T/1P	1T	24
	TOTAL	**60**	**104**	**14**	**40**	**50**	**104**

Reference Books:

1. Signals and Systems V. Oppenheim, A. S. Wilsky and S. H. Nawab, , Pearson Education (2007)
2. Signal and Systems S. Haykin and B. V. Veen, , John Wiley & Sons (2004)
3. Fundamentals of Electric Circuits C. Alexander and M. Sadiku, , McGraw Hill (2008)
4. Signals and Systems H. P. Hsu, , Tata McGraw Hill (2007)
5. Signal and Systems: with MATLAB Computing and Simulink Modelling S. T. Karris, , Orchard 1st edition)

DEPARTMENT OF ELECTRONICS
Semester-V
Signals And Systems Pracicals DSE –ELE-505A-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:4 **Credits : 2**

Course objectives: This course (DSE –ELE-505A) will enable the students to

1. To perform experiments to study the signals using mathematical concepts and to understand the how toperform mathematical signals on signals
2. To perform experiments to familiar with commonly used signals such as the unit step,ramp ,impulse function,sinusoida signals and complex exponential.

Course Outcome: After successful completion of the course, students will develop the skill to;

DSE –ELE-505A-P.1 Demonstration of experiments to Understand mathematical description of continuous and discrete time signals and systems
DSE –ELE-505A-P.2 - Demonstration of Simulation of experiments in S&S
DSE –ELE-505A-P.3 - model, simulate, verify, and synthesize with hardware description languages.
DSE –ELE-505A-P.4 - understand and use major syntactic elements of VHDL - entities, architectures, processes, functions, common concurrent statements, and common sequential statements.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE –ELE-505A-P.1	3	2	3	3	2	3	3	-	3	3	3
DSE –ELE-505A-P.2	3	2	3	3	2	2	3	-	2	3	3
DSE –ELE-505A-P.3	3	2	3	3	1	2	3	-	2	3	3
DSE –ELE-505A-P.4	3	2	3	3	2	2	2	-	2	3	3

Course Content

1. Generation of Signals: continuous time
2. Generation of Signals: discrete time
3. Time shifting and time scaling of signals
4. Solution of Difference equations
5. Convolution of Signals
6. Fourier series representation of continuous time signals
7. Fourier transform of continuous time signals
8. Laplace transform of continuous time signals
9. Introduction to Xcos/similar function and calculation of output of systems represented by block diagrams

Note: Minimum of Eight experiments to be done

Blue print:

Sl. No.	Particulars	Marks
1	Flow chart	05
2	Algorithm	05
3	Program writing/coding	10
4	Program execution	07
5	Journal	04
6	Oral	04
	TOTAL	**35**

DEPARTMENT OF ELECTRONICS
Semester-V
VERILOG & VHDL DSE –ELE-505B-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) : 4:0:0 **Credits : 4**

Course objectives: This course (DSE –ELE-505B) will enable the students to

1. Describe VHDL language programming, hardware description languagesVHDL programming structure.
2. Define entity, architecture, Describe VHDL data types, Describe VHDL operators, Describe sequentialstatements, DescribeSubcircuitdesign, Describe package and component statements

Course Outcome: After successful completion of the course, students are able to;

DSE –ELE-505B-T.1 – Explain VHDL as a programming language
DSE –ELE-505B-T.2 – Discuss the combinational and sequential logic circuits using VHDL
DSE –ELE-505B-T.3 – Explain Programmable logic devices (PLDs) and Networks of Arithmetic operations.
DSE –ELE-505B-T.4 – Gain proficiency with VHDL software package and use software package to solve problems on a wide range of digital logic circuits

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE –ELE-505B-T.1	3	2	3	3	2	3	3	-	3	3	3
DSE –ELE-505B-T.2	3	2	3	3	2	2	3	-	2	3	3
DSE –ELE-505B-T.3	3	2	3	3	1	2	3	-	2	3	3
DSE –ELE-505B-T.4	3	2	3	3	2	2	2	-	2	3	3

Course content

UNIT I: Digital logic design flow, Review of combinational circuits. Combinational building blocks: multiplexers, demultiplexer, decoders, encoders and adder circuits. Review of sequential circuit elements: flip-flop, latch and register. Finite state machines: Mealy and Moore. Other sequential circuits: shift registers and counters.**(15hours)**

UNIT II: Basic Language elements Identifiers, Data Objects, Data types, Operators

Behavioral Modeling:- Entity Declaration, Architecture Body, Process statement, Variable assignment statement, Signal Assignment, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, More on Signal Assignment statement, other sequential statements **(15hours)**

UNIT III : Data flow modeling Concurrent Signal Assignment, Concurrent versus Sequential Signal Assignment, Delta Delay Revisited, Multiple Drivers, Conditional Signal Assignment Statement, Selected Signal Assignment Statement, The UNAFFECTED value, Block Statement, Concurrent Assertion Statement, Value of signal

Structural Modeling: An example, Component Declaration, Component Instantiation, Other examples Resolving Signal Values. (15hours)

UNIT IV : Verilog HDL: Introduction to HDL. Verilog primitive operators and structural Verilog Behavioral Verilog. Design verification. Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design examples in Verilog **(15hours)**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	Digital logic flow	15	24	2T	1T/1P	1T	24
II	Behavioral modelling	15	24	2T	1T/1P	1T	24
III	Data flow modelling	15	32	1T	1T/1P	2T	32
IV	Verilog HDL	15	24	2T	1T/1P	1T	24
	TOTAL	**60**	**104**	**14**	**40**	**50**	**104**

Reference Books:

1. VHDL primer (Third Edition)-J.Bhasker (Pearson Education Asia)
2. VHDL programming by example –by Douglas.L.Perry(TATA McGRAW-HILL EDITION.

DEPARTMENT OF ELECTRONICS
Semester-V

VERILOG AND VHDL LAB DSE –ELE-505B-P

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:4 **Credits : 2**

Course objectives: This course (DSE-ELE-505B-P) will enable the students to

1. Perform experiments to study VHDL language programming,hardware description languagesVHDL programming structure.
2. Experiment to demonstrate the entity,architecture,Describe VHDL data types, VHDL operators, sequentialstatements, eSubcircuitdesign, package and component statement

Course Outcome: After successful completion of the course, students develop the skill to;

DSE-ELE-505B-P.1 – Demonstration of experiments to Understand mathematical description of continuous and discrete time signals and systems
DSE-ELE-505B-P.2 – Demonstration of Simulation of experiments in VHDL
DSE-ELE-505B-P.3 – Model, simulate, verify, and synthesize with hardware description
DSE-ELE-505B-P.4 – Understand and use major syntactic elements of VHDL - entities, architectures, processes, functions, common concurrent statements, and common sequential statements

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE-ELE-505B-P.1.1	3	2	3	3	2	3	3	-	3	3	3
DSE-ELE-505B-P.1.2	3	2	3	3	2	2	3	-	2	3	3
DSE-ELE-505B-P.1.3	3	2	3	3	1	2	3	-	2	3	3
DSE-ELE-505B-P.1.4	3	2	3	3	2	2	2	-	2	3	3

Course Content

VHDL

1. Behavioral modeling and simulation of basic gates
2. Structural modeling and simulation of simple Boolean expression
3. Modeling and simulation of adders and subtractors
4. Modeling and simulation of magnitude comparators
5. Modeling and simulation of Flip-flops
6. Modeling and simulation of Shift registers
7. Modeling and simulation of encoders and decoders
8. Modeling and simulation of Counters

VERILOG

1. Write code to realize basic and derived logic gates
2. Half adder, Full Adder using basic and derived gates
3. Half subtractor and Full Subtractor using basic and derived gates
4. Design and simulation of a 4 bit Adder
5. Multiplexer (4x1) and Demultiplexer using logic gates
6. Decoder and Encoder using logic gates.
7. Clocked D, JK and T Flip flops (with Reset inputs).
8. 3-bit Ripple counter

Blue Print

Sl. No.	Particulars	Marks
1.	Flow chart	05
2.	Algorithm	05
3.	Program writing/coding	10
4.	Program execution	07
5.	Journal	04
6.	Oral	04
	TOTAL	**35**

DEPARTMENT OF ELECTRONICS
Semester-V

PCB Fundamentals SEC-ELE-505A-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) : 2:0:0 **Credits : 2**

Course objectives: This course (SEC-ELE-505A.T) will enable the students to

This course will teach teams of students how to design and fabricate PCB for prototyping as well as in Industrial Production environment. This will help students to innovate faster with electronics technology.

Course Outcome: After successful completion of the course, students are able to

SEC-ELE-505A-T.1 Understand a single layer and multilayer PCB
SEC-ELE-505A-T.2 Create and fabricate a PCB

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-505 A- T.1	3	2	3	3	2	3	3	-	3	3	3
SEC-ELE-505 A-	3	2	3	3	2	2	3	-	2	3	3

Course Content

Unit I

Types of PCB:

Single sided board, double sided, Multilayer boards, Plated through holes technology, Benefits of Surface Mount Technology (SMT), Limitation of SMT, Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.

Layout and Artwork:

Layout Planning: General rules of Layout, Resistance, Capacitance and Inductance, Conductor Spacing, Supply and Ground Conductors, Component Placing and mounting, Cooling requirement and package density, Layout check. Basic artwork approaches, Artwork taping guidelines, General artwork rules:Artwork check and Inspection

15 hours

Unit II

Laminates and Photo printing: Properties of laminates, Types of Laminates, Manual cleaning process, Basic printing process for double sided PCB's, Photo resists, wet film resists, Coating process for wet film resists, Exposure and further process for wet film resists, Dry film resists.

Etching and Soldering:Introduction, Etching machine, Etchant system. Principles of Solder connection, Solder joints, Solder alloys, Soldering fluxes. Soldering, Desoldering tools and Techniques.

Technology OF PCB:

Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper clad laminates **15hours**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	Types of PCB	08	14	2T	1T &1P	-	14
	Layout and Artwork	09	19	2T	1T	1T	19
II	Laminates and Photo printing	07	14	2T	-	1T	14
	Etching and Soldering	06	12	1T	1T & 1P	-	12
	TOTAL	**30**	**59**	**14**	**25**	**20**	**59**

Reference Books:

1. Walter C.Bosshart "PCB DESIGN AND TECHNOLOGY" Tata McGraw Hill Publications, Delhi. 1983
2. Clyde F.Coombs "Printed circuits Handbook" III Edition, McGraw Hill

DEPARTMENT OF ELECTRONICS
Semester-IV

PCB fundamentals practicals SEC-ELE-505A-P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 2 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:2 **Credits : 1**

Course objectives: This course (SEC-ELE-505A.P) will enable the students to

1. Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
2. Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools

Course Outcome: After successful completion of the course, students develop the skill to

SEC-ELE-505A-P.1 Upon completion of the PCB design course, the students should be able to carry out any PCB design

SEC-ELE-505-.P.2. Students will also be able to create schematics from blue-prints, they will also be able to perform simple simulations

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-505A-P.1	3	2	3	3	2	3	3	-	2	3	3
SEC-ELE-505A-P.2	3	2	3	3	2	2	3	-	1	3	3

Course Content

1. Beginning a new Schematic
2. Placing items in the schematic, placing symbols and ports labeling components
3. Working with Sheets and Ports
4. Checking the Schematic for Errors
5. Placing Power and Ground Planes
6. Changing the Board's Perimeter
7. Linking the Schematic and PCB
8. Keyboard Shortcuts
9. Troubleshooting error
10. Printing process,
11. Placing of circuit on copper clad
12. Etching process for final PCB
13. Testing & Troubleshooting
14. Drilling of designed PCB
15. Soldering Process of Components
16. Rolling and soldering

Blue print:

Sl. No.	Particulars	Marks
1	Flow chart	05
2	Algorithm	05
3	Program writing/coding	10
4	Program execution	07
5	Journal	04
6	Oral	04
	TOTAL	35

DEPARTMENT OF ELECTRONICS

Semester-V

Power Electronics SEC-ELE-505B-T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) : 2:0:0 **Credits : 2**

Course objectives: This course (SEC-ELE-505B.T) will enable the students to

- To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics.
- To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications

Course Outcome: After successful completion of the course, students are able to

SEC-ELE-505B-T.1 Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices

SEC-ELE-505B-T.2- Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-505B-T.1	3	2	3	3	2	3	3	-	3	3	3
SEC-ELE-505B-T.2	3	2	3	3	2	2	3	-	2	3	3

Course Content

Unit I

Power Devices:

Need for semiconductor power devices, Power diodes, Enhancement of reverse blocking capacity, Introduction to family of thyristors.

Silicon Controlled Rectifier (SCR):

Structure, I-V characteristics, Turn-On and Turn-Off characteristics, ratings, Factors affecting the characteristics ratings of SCR **15hours**

Unit II

Diac and Triac:

Basic structure, working and V-I characteristic of, application of a Diac as a triggering device for a Triac.

Insulated Gate Bipolar Transistors (IGBT):

Basic structure, I-V Characteristics, switching characteristics.

Application of SCR:

SCR as a static switch, phase controlled rectification, single phase half wave, full wave and bridge rectifier switch inductive & non-inductive loads **15hours**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	Power Devices	08	14	2T	1T &1P	-	14
	Silicon Controlled Rectifier (SCR)	09	19	2T	1T	1T	19
II	Diac and Triac	07	14	2T	-	1T	14
	Application of SCR	06	12	1T	1T & 1P	-	12
	TOTAL	**30**	**59**	**14**	**25**	**20**	**59**

Reference Books:

1. Power Electronics, K. Hari Babu, Scitech Publication.
2. Power Electronics, P.C.Sen, TMH.
3. Power Electronics & Controls, S.K. Dutta.
4. Power Electronics, M.D.Singh&K.B. Khanchandani, TMH.
5. Power Electronics Circuits, Devices and Applications, 3rd Edition, .H.Rashid, Pearson Education.
6. Power Electronics, Applications and Design, Ned Mohan,Tore.
7. Power Electronics, P.C.Sen, TMH.
8. Power Electronics, M.S.Jamil Asghar,PHI.
9. A Textbook of Electrical Technology-Vol-II,B.L.Thareja,A.K.Thareja, S.Chand.

DEPARTMENT OF ELECTRONICS
Semester-V
Power Electronics SEC-ELE-505B-P

Teaching Hours : 2 **CIA Marks : 15**
Examination Hours : 2 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:2 **Credits : 1**

Course objectives: This course (SEC-ELE-505B.P.P) will enable the students to

1. This course aims at obtaining characteristics of power electronic devices.
2. To understand the commutation techniques used in power electronics circuits and to test different power electronics converter

Course Outcome: After successful completion of the course, students develop the skill to

SEC-ELE-505B-P.1 Able to Elucidate the basic operation of various power semiconductor devices and passive components.

SEC-ELE-505B-P.2. Able to analyze power electronics circuits

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-505B-P.1	3	2	3	3	2	3	3	-	2	3	3
SEC-ELE-505B-P.2	3	2	3	3	2	2	3	-	1	3	3

Course Content

1. Study of I-V characteristics of DIAC
2. Study of I-V characteristics of a TRIAC
3. Study of I-V characteristics of a SCR
4. SCR as a half wave and full wave rectifier switch R and RL loads
5. DC motor control using SCR
6. DC motor control using TRIAC
7. AC voltage controller using TRIAC with UJT triggering
8. UJT as relaxation oscillator

Blue print:

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column	03
5	Record of observations	06
6	Graph and calculations	06
7	Unit and accuracy	02
8	Journal	04
9	Oral	04
	TOTAL	35

DEPARTMENT OF ELECTRONICS
Semester-VI

Photonic Devices And Power Electronics DSE-ELE-606A-T

Teaching Hours : 60 **CIA Marks : 30**
Examination Hours : 3 **SEE Marks : 70**
Scheme (L:T:P) : 4:0:0 **Credits : 4**

Course objectives:

This course (DSE-ELE-606A) will enable the students to

1. Scientific study and application of light — has evolved to become a key technology.
2. Includes Study of lasers, LEDs and other light sources.

Imaging, detectors and sensors, optoelectronic devices and components

3. To give a systematic approach for transient and steady state transient and steady state analysis of all power electronic devices with the study of working and characteristics..

Course Outcome: After successful completion of the course, students are able to;

DSE-ELE-606A-T.1 - Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices.

DSE-ELE-606A-T.2- Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits

DSE-ELE-606A-T.3- Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.

DSE-ELE-606A-T.4 - Formulate and analyze a power electronic design at the system level and assess the performance.

CO-PO & PSO Mapping:

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE-ELE-606A-T.1	3	2	3	3	2	-	3	3	3	3	3
DSE-ELE-606A-T.2-	3	2	3	3	2	-	3	3	2	3	3
DSE-ELE-606A-T.3	3	2	3	3	1	-	3	3	2	3	3
DSE-ELE-606A-T.4	3	2	3	3	2	-	2	3	2	3	3

Course Content

UNIT I:

PHOTONIC DEVICES

Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption. Light Emitting Diodes- Construction, materials and operation. Semiconductor Laser- Condition for amplification, laser cavity, hetero- structure and quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current. Laser diode.

Photodetectors: Photoconductor. Photodiodes (p-i-n, avalanche) and Photo transistors, quantum efficiency and responsivity. Photomultiplier tube.

Solar Cell: Construction, working and characteristics LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays, applications, advantages over LED displays. **(23 hours)**

UNIT II:

Introduction to Fiber Optics: Evolution of fiber optic system- Element of an Optical Fiber Transmission link-Ray Optics-Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure. **(13 Lectures)**

UNIT III:

Power Devices: Need for semiconductor power devices, Power MOSFET (Qualitative). Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-V characteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits. Diac and Triac- Basic structure, working and V-I characteristics. Application of Diac as a triggering device for Triac.

Bipolar Transistors (IGBT): Basic structure, I-V Characteristics, switching characteristics, device limitations and safe operating area (SOA). **(12 Lectures)**

UNIT IV:

Applications of SCR: Phase controlled rectification, AC voltage control using SCR and Triac as a switch. Power Invertors- Need for commutating circuits and their various types, dc link invertors, Parallel capacitor commutated invertors, Series Invertor, limitations and its improved versions, bridge invertors. **(12 Lectures)**

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	PHOTONIC DEVICES	23	24	2T	1T/1P	1T	24
II	Introduction to Fiber Optics	13	24	2T	1T/1P	1T	24
III	Power Devices:	12	32	1T	1T/1P	2T	32
IV	Applications of SCR	12	24	2T	1T/1P	1T	24
	TOTAL	**60**	**104**	**14**	**40**	**50**	**104**

Reference Books:

1. Optoelectronics, J. Wilson and J.F.B. Hawkes, Prentice Hall India (1996)
2. Optoelectronics and Photonics, S.O. Kasap, Pearson Education (2009)
3. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.
4. Introduction to fiber optics, AK Ghatak & K Thyagarajan, Cambridge University Press (1998)
5. Power Electronics, P.C. Sen, Tata McGraw Hill
6. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill
7. Introduction to fiber optics, AK Ghatak and K Thyagarajan, Cambridge University Press (1998)
8. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill
9. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H.Rashid, Pearson Education
10. A Textbook of Electrical Technology,Vol-II, B.L.Thareja, A.K.Thareja, S.Chand

DEPARTMENT OF ELECTRONICS
Semester-VI
Project DSE-ELE-606-Prj

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:4 **Credits : 2**

Course objectives: This course (DSE-ELE-606B-P) will enable the students to

- Demonstrate the personal abilities and skills required to produce and present an extended piece of work
- engage in personal inquiry, action and reflection on specific topics and issues
- Focus on, and demonstrate an understanding of, the areas of interaction
- Reflect on learning and share knowledge, views and opinions.

Course Outcome: After successful completion of the course, students develop the skill to;

DSE-ELE-606- Prj.1– Demonstrate a sound technical knowledge of their selected project topic.
DSE-ELE-606 -Prj.2 – Undertake problem identification, formulation and solution
DSE-ELE-606 -Prj.3 – Design technical solutions to complex problems utilising a systems approach
DSE-ELE-606-Prj.4 – Conduct an electronics project

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE-ELE-606- Prj.1	3	3	3	3	3	3	3	3	3	3	3
DSE-ELE-606- Prj.2	3	3	3	3	3	3	3	3	3	3	3
DSE-ELE-606- Prj.3	3	3	3	3	3	3	3	3	3	3	3
DSE-ELE-606- Prj.3	3	3	3	3	3	3	3	3	3	3	3

Course Content
Blue Print

Sl. No.	Particulars	Marks
1.	Written	05
2.	PPT presentation	05
3.	Model and working	10
4.	Project report	10
5.	Oral	05
	TOTAL	**35**

DEPARTMENT OF ELECTRONICS

Semester-VI

Semiconductor Devices Fabrication DSE-ELE-606B-T

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:4 **Credits : 2**

Course objectives:

- To learn the basic MOS Circuits •
- To learn the MOS Process Technology •
- To understand the operation of MOS devices. •
- To impart in-depth knowledge about analog and digital CMOS circuits

Course Outcome: After successful completion of the course, students develop the skill to;

DSE-ELE-606 B-T.1- Understanding of different substrate material manufacturing
DSE-ELE-606 B-T.2- Study of Epitaxy & oxidation
DSE-ELE-606 B-T.3- Discuss about lithography process.
DSE-ELE-606 B-T.4- Identify the various IC fabrication methods

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE-ELE-606 B-T.1-	3	1	3	2	2	-	-	3	-	3	3
DSE-ELE-606 B-T.2	3	1	3	2	2	-	-	3	-	3	3
DSE-ELE-606 B-T..3	3	1	3	2	1	-	-	3	-	3	3
DSE-ELE-606 B-T.4	3	-	3	2	2	-	-	3	-	3	3

Course Content

Unit-1: CRYSTAL GROWTH AND EPITAXY :

Crystal Growth : Introduction, Electronic grade silicon, Czochralski Crystal growing, Silicon shaping, Processing consideration.

Epitaxy : Introduction, Vapour-Phase epitaxy, Molecular beam epitaxy, silicon on insulators, Epitaxial Evaluation

Unit-2 : OXIDATION AND LITHOGRAPHY :

Oxidation : Introduction, Growth mechanism and kinetics, Thin Oxides, Oxidation techniques and systems, Oxide Properties, Redistributions of dopants at interface, Oxidation of poly silicon, Oxidation induced defects.

Lithography : Introduction, Optical, Electron, X-ray and Ion Lithography

Unit-3: ETCHING AND FILM DEPOSITION TECHNIQUES :

Etching : Introduction , plasma properties and features.

Film Deposition: Introduction, Deposition Processes, Polysilicon, Silicon dioxide, Silicon Nitride, Plasma Assisted depositions, other materials.

Unit-4: DIFFUSION :

Introduction, models of diffusion in solids, Fick's one Dimension diffusion equations, atomic diffusion mechanisms, Diffusivitives of B,P, As and Sb, Measurement techniques, Fast Diffusants in silicon, Diffusion in Polycrystalline silicon, Diffusion in SiO2, Diffusion enhancements and retardation.

Blue Print

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column/truth table	03
5	Record of observations/Program writing	08
6	Execution	06
8	Journal	04
9	Oral	04
	TOTAL	**35**

DEPARTMENT OF ELECTRONICS
Semester-VI
Project DSE-ELE-606- Prj

Teaching Hours : 40 **CIA Marks : 15**
Examination Hours : 4 **SEE Marks : 35**
Scheme (L:T:P) : 0:0:4 **Credits : 2**

Course objectives: This course (DSE-ELE-606- Prj) will enable the students to

- Demonstrate the personal abilities and skills required to produce and present an extended piece of work
- engage in personal inquiry, action and reflection on specific topics and issues
- Focus on, and demonstrate an understanding of, the areas of interaction
- Reflect on learning and share knowledge, views and opinions.

Course Outcome: After successful completion of the course, students develop the skill to;

DSE-ELE-606- Prj.1 – Demonstrate a sound technical knowledge of their selected project topic.
DSE-ELE-606- Prj.2 – Undertake problem identification, formulation and solution
DSE-ELE-606- Prj.3 – Design technical solutions to complex problems utilising a systems approach
DSE-ELE-606-Prj.4 – Conduct an electronics project

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
DSE-ELE-606 -Prj.1	3	3	3	3	3	3	3	3	3	3	3
DSE-ELE-606- Prj.2	3	3	3	3	3	3	3	3	3	3	3
DSE-ELE-606- Prj.3	3	3	3	3	3	3	3	3	3	3	3
DSE-ELE-606- Prj.3	3	3	3	3	3	3	3	3	3	3	3

Course Content

Blue Print

Sl. No.	Particulars	Marks
6.	Written	05
7.	PPT presentation	05
8.	Model and working	10
9.	Project report	10
10.	Oral	05
	TOTAL	**35**

DEPARTMENT OF ELECTRONICS
Semester-VI SEC
Programming In C SEC-ELE-606 -T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) : 2:0:0 **Credits : 2**

Course objectives: This course (SEC-ELE-606) will enable the students to

- The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C.
- By learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcome: After successful completion of the course, students are able to

1. SEC-ELE-606-T.1: Recollect various programming constructs and to develop C programs.
2. SEC-ELE-606-T.2: Understand the fundamentals of C programming.
3. SEC-ELE-606-T.3: Choose the right data representation formats based on the requirements of the problem.
4. SEC-ELE-606-T.4: Implement different Operations on arrays, functions, pointers, structures, unions and files

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-606-T.1	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-T.2	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-T.3	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-T.4	3	3	3	3	3	3	3	3	3	3	3

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Course Content

UNIT I

Overview of C

Importance of C, Sample C programs, Basic structure of C Programs, Programming style, executing a C Program.

Constants, Variables, and Data Types

Character set, C tokens, Keywords and identifiers, Constants, Variables, Data types, Declaration of variables, Assigning values to variables, Defining symbolic constants

Operators and Expression

Arithmetic of Operators, Relational operators, Logical operators Assignment operators, Increment and decrement operators, Conditional operator, Bit wise operators, Special operators, Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Operator precedence and associatively, Mathematical functions.

Managing Input and Output Operations

Reading a character, writing a character, formatted input, formatted output

Decision Making and Branching

Decision making with IF statement, Simple IF statement, The IF ELSE statement, Nesting of IF ... ELSE statements, The ELSE IF ladder, the switch statement, the: Operator, The GOTO statement. **(15 hours)**

UNIT II

Decision Making and Looping

The WHILE statement, The DO statement, The FOR statement, Jumps in loops

Arrays

One-dimensional arrays, Two-dimensional arrays, initializing two-dimensional arrays.

Handling of character strings

Declaring and initializing string variables, Reading strings from terminal, Writing strings to screen, Arithmetic operations on characters, Putting strings together Comparison of two strings **(15 hours)**

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	Overview of C	04	09	2T	1T	--	09
	Operators and expression	06	14	2T	--	1T	14
II	Decision making and looping	08	14	2T	2T	--	14
	Arrays	12	22	1T	2T	1T	22
	TOTAL	**30**	**59**	**14**	**25**	**20**	**59**

Reference Books :

1. Programming in ANSI C- 2ndEdition ,TMH Balagurusawmi
2. Computer Programming in C by V Rajaraman, PHI, NewDelhi, 1995.
3. Programming in C by Hutchison.R, McGraw Hill, New York, 1990.
4. Application program in C by Johnsonburgh, R and Kalin,M.

DEPARTMENT OF ELECTRONICS
Semester-VI
RPracticals C programming SEC-ELE-606-P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) : 2:0:0 **Credits : 2**

Course objectives: This course (ELE-622) will enable the students to

- Programming knowledge of C language.
- Students will be able to develop logics which will help them to create programs, applications in C.
- By learning the basic programming constructs they can easily switch over to any other language in future..

Course Outcome

Programming in C

1. SEC-ELE-606-P .1:Recollect various programming constructs and to develop C programs.
2. SEC-ELE-606-P .2:Understand the fundamentals of C programming.
3. SEC-ELE-606-P.3:Choose the right data representation formats based on the requirements of the problem.
4. SEC-ELE-606-P.4: Implement different Operations on arrays, functions, pointers, structures, unions and files.

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-606-P.1	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-P.2	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-P.3	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-P.4	3	3	3	3	3	3	3	3	3	3	3

Course content

1. Write c program for Addition of given number
2. Write c program for Subtracting of given number
3. Write a C program to count number of bits in string
4. Write c program for Division of given number
5. Write c program for palindrome
6. Write c program for Fibonacci number
7. Write c program to find average of given numbers
8. Write c program to find entered number is prime or not
9. Write c program to find entered number is even or not
10. Write c program for Multiplication of given number
11. Write c program to reverse a given number
12. Write c program to find a square root of given numbers
13. Write c program to find area of circle.
14. Write c program to swap two given numbers
15. Write a C program to print month and day
16. Simple calculator using C programming

Blue Print

Sl. No.	Particulars	Marks
1	Flow chart	05
2	Algorithm	05
3	Program writing/coding	10
4	Program execution	07
5	Journal	04
6	Oral	04
	TOTAL	**35**

DEPARTMENT OF ELECTRONICS
Semester-VI SEC
Applied optics SEC-ELE-606 T

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) : 2:0:0 **Credits : 2**

Course objectives: This course (SEC-ELE-606B) will enable the students to

- To be able to apply the fundamental concepts of optics in lasers, optical fiber communications and optoelectronics

Course Outcome: After successful completion of the course, students are able to

1. SEC-ELE-606B-T.1: Identify few different applications of optics i.e. Laser, Fiber Optics, Optoelectronics and Non Linear Optics.
2. SEC-ELE-606B-T.2: Analyze different laser systems and its applications in various field

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-606B.1	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606B.2	3	3	3	3	3	3	3	3	3	3	3

Teaching Pedagogy:

Chalk and talk, Power point Presentation, Videos, animation etc.

Course Content

Unit I

Sources and Detectors

Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.

Fourier Optics

Concept of Spatial frequency filtering, Fourier transforming property of a thin lens

Fourier Transform Spectroscopy

Fourier Transform Spectroscopy (FTS) is a powerful method for measuring emission and absorption spectra, with wide application in atmospheric remote sensing, NMR spectrometry and forensic science.

Unit II

Holography

Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition

Photonics: (Fibre Optics)

Optical fibres and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating

Blue print :

Unit No.	Name of the topics	Teaching hours	Marks per unit	Marks 2	Marks 5	Marks 10	Total Marks
I	Sources and Detectors	04	09	2T	1T	--	09
	Fourier Optics	06	14	2T	--	1T	14
II	Holography	08	14	2T	2T	--	14
	Photonics: (Fibre Optics)	12	22	1T	2T	1T	22
	TOTAL	**30**	**59**	**14**	**25**	**20**	**59**

Reference Books

1. LASERS: Fundamentals & applications, K.Thyagrajan & A. K.Ghatak, 2010,Tata McGraw Hill
2. Fibre optics through experiments, M. R. Shenoy, S.K. Khijwania, et.al. 2009, Viva Books 27
3. Optical Electronics, Ajoy Ghatak and K. Thyagarajan, 2011, Cambridge University Press
4. Optics, Karl Dieter Moller, Learning by computing with model examples, 2007, Springer.
5. Optoelectronic Devices and Systems, S. C. Gupta, 2005, PHI Learning Pvt. Ltd.

DEPARTMENT OF ELECTRONICS
Semester-VI

Applied optics Practicals SEC-ELE-606B-P

Teaching Hours : 30 **CIA Marks : 15**
Examination Hours : 1.5 **SEE Marks : 35**
Scheme (L:T:P) : 2:0:0 **Credits : 2**

Course objectives: This course (ELE-622B-p) will enable the students to

- know basic optical phenomena involved in the generation of color of objects from a physical point of view.
- understand the fundamentals and the basic tools which explain these phenome

Course Outcome

SEC-ELE-606B-P .1: Analyze the intensity variation of light due to Polarization, interference and diffraction
SEC-ELE-606B-P .2: Explain working principle of lasers

Mapping of CO with PO and PSO:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO
SEC-ELE-606-P.1	3	3	3	3	3	3	3	3	3	3	3
SEC-ELE-606-P.2	3	3	3	3	3	3	3	3	3	3	3

Course content

Experiments on Lasers:

1. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.
2. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser.
3. To find the polarization angle of laser light using polarizer and analyzer d. Thermal expansion of quartz using laser

Experiments on Semiconductor Sources and Detectors:

1. V-I characteristics of LED
2. Study the characteristics of solid state laser
3. Study the characteristics of LDR
4. Photovoltaic Cell
5. Characteristics of IR sensor

Blue Print:

Sl. No.	Particulars	Marks
1	Relevant formula and nature of graph	03
2	Circuit/block diagram	03
3	Experiment skill and connection	04
4	Tabular column/truth table	03
5	Record of observations/Program writing	08
6	Execution	06
8	Journal	04
9	Oral	04
	TOTAL	**35**