Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF SCIENCE AND HUMANITIES

PROGRAM: B.Sc. (PCM)

SCHEME & SYLLABUS BOOKLET

BATCH 2025-2028

FACULTY OF SCIENCE AND HUMANITIES
PROGRAM: B.Sc. (PCM)

SCHEME & SYLLABUS (2025-2028)

INDEX

Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

Vision

Our vision is to create knowledge based society with scientific temper, team spirit and dignity of labour to face global competitive challenges.

Mission

Our mission is to evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide quality education through faculty development, updating of facilities and continual improvement for meeting norms laid down by the government, keeping the stakeholders satisfied. Poornima University has forged industrial alliances with Top MNC's worldwide which assures high educational standards, up to- date and forward-thinking curricula, and professional relevance. At Poornima University you will have a distinct advantage through exposure to the corporate standard environment through industry sponsored infrastructure and expert faculty. The University involves global industry leaders in many ways.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.

About Program and Program Outcomes (PO)

Title of the Program: Bachelor of Science (B.Sc.)

Nature of the Program: B. Sc. is three-year full-time programme

Program Outcomes (POs):

Graduates will be able to:

PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of B.Sc. program.

PO2: Scientific reasoning and Problem solving: Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences Capacity to extrapolate from what one has learned and apply their competencies to solve real life-situations

PO3: Analytical reasoning and Research related skills: Define problems, formulate hypotheses, test, analyze, interpret and draw conclusions from data and report the results of an experiment or investigation

PO4: Critical thinking: identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO5: Digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO6: Reflective thinking: Possess knowledge of Critical sensibility to lived experiences, with self- awareness and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO7: Environment and sustainability: Appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

PO8: Moral and ethical awareness: Ability to embrace ethical values in conducting one's life, formulates a position about an ethical issue from multiple perspectives, and use ethical practices in all work.

PO9: Leadership qualities: Capability for mapping out the tasks of a team or an organization, and setting direction to work effectively and respectfully with diverse teams; and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

PO10: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; present complex information in a clear and concise manner.

PO11: Project management and finance: Ability to work independently, identify appropriate resources required for a project, and manage a project.

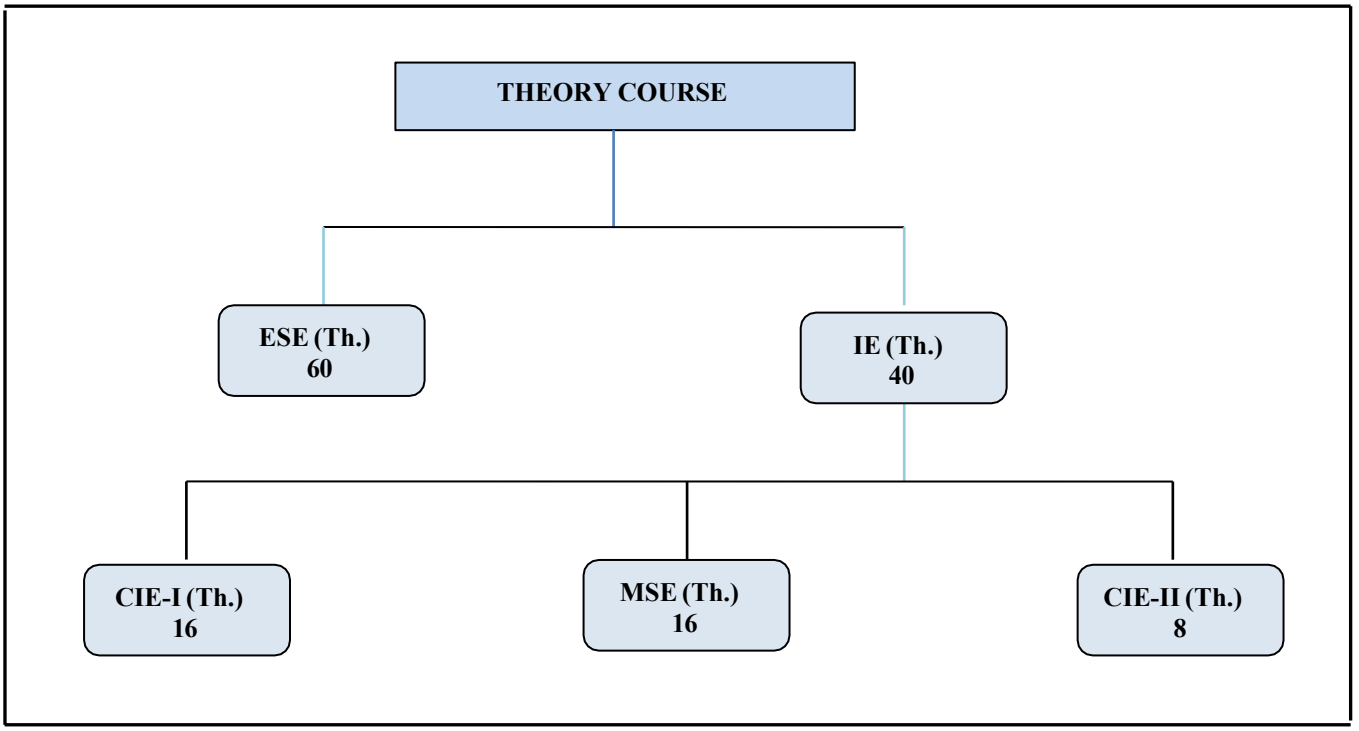
PO12: Lifelong learning: Ability to acquire knowledge and skills in learning activities throughout life aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place.

Program Specific Outcomes (PSOs):

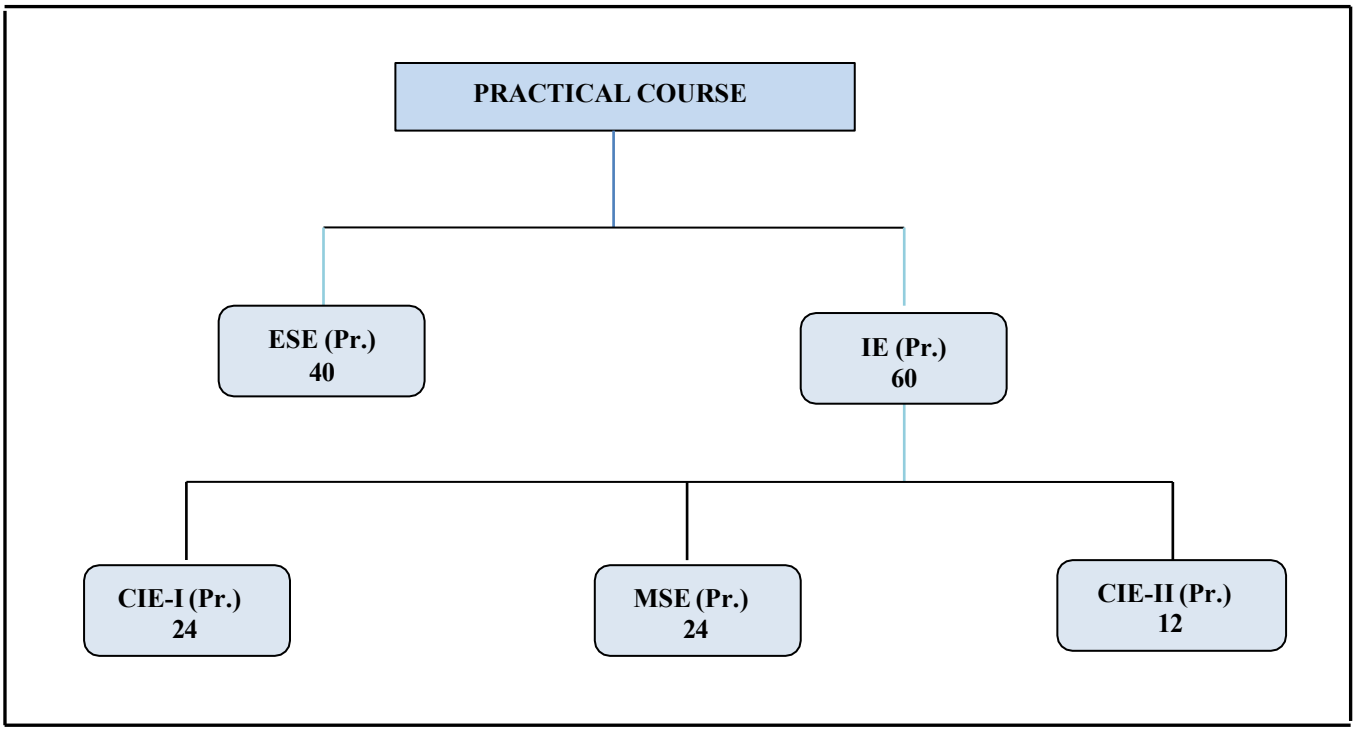
1. **PSO1:** Advancement in Science: The ability to comprehend and implement the knowledge of various aspects of Science i.e. Physics, Chemistry and Mathematics.
2. **PSO2.**Technical skills: The proficiency to understand, apply and analyze the concepts of various technical fields like Fundamentals of computer, programming in C, MATLAB and renewable energy.
3. **PSO3.**Career Skills: The skills to apply analyze and evaluate industry best practices by developing innovative projects and acquaintance of attitude required to work professionally, for higher studies and research, and to be an entrepreneur.

Examination System

Marks Distribution of Theory Course:



Marks Distribution of Practical Course :



Th.: Theory, Pr.: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

CO Wise Marks Distribution:

Exam Entity	Theory Subject		Practical/ Studio Subject	
	Maximum Marks	CO to be Covered	CO to be Covered	Maximum Marks
CIE-I	16 (8 + 8)	1 & 2	1 & 2	24 (12 + 12)
MSE	16 (8 + 8)	3 & 4	3 & 4	24 (12 + 12)
CIE-II (Activity/ Assignment)	8 (8)	5	5	12 (12)
ESE	60	-	-	40
TOTAL	100	-	-	100

Minimum Passing Percentage in All Exams:

S. No.	Program Name	Minimum Passing Percentage in		
		IE Component	ESE Component	Total Component
1	Course Work for PhD Registration	-	-	50%
2	B. Arch., FIRE Dept. (BBA, B. Com., MBA)	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	B. Tech., B. Des., BVA, BCA, B.Sc., BBA, B.Com., B.A. & any other program	-	35%	35%

SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

Grading Table

Table-A

Applicable for B.Arch., FIRE Courses (BBA, B.Com, MBA), & PhD. Course Work

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Fail	F	0	x <50
Absent	Ab	0	Absent

Table-B

Applicable for All Courses except Table-A

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Average	C	5	40≤ x <50
Pass*	P	4	35≤ x <40
Fail	F	0	x <35
Absent	Ab	0	Absent

*** Not applicable for master programs**

CGPA to percentage conversion rule:

Equivalent % of Marks in the Program = *CGPA* *10

Award of Class

CGPA	Percentage	Equivalent Division
7.50 ≤ CGPA	75% or more	First Division with Distinction
6.00 ≤ CGPA < 7.50	60% ≤ x <75%	First Division
5.00 ≤ CGPA < 6.00	50% ≤ x <60%	Second Division
4.00 ≤ CGPA < 5.00	40% ≤ x < 50%	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2025-26)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme can be chosen from SWAYAM-NPTEL.

1. Introduction of MOOCs: SWAYAM-NPTEL

About SWAYAM-NPTEL

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects
- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers
- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.
Some statistics regarding the open online courses since March 2014 till Dec 2021
Completed courses: 3496;
Enrollments across courses: 1.58 CRORE +
Number of exam registrations: 15.1 LAKH +
All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses. All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

(a) MOOCs as Credit Courses

(For this document, only those MOOCs will be considered which are available only on NPTEL platforms)

- Credit and Non-credit SWAYAM-NPTEL MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.

- As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards): Open Elective (for batches entered till 2022) courses were available at University level in offline mode till 2022-23 for which relevant booklets were published. From session 2023-24, Multidisciplinary Courses are introduces in lieu of open elective courses as per NEP 2020. These courses carries 02 credits. These category/type of courses (similar/different) are available as MOOC courses on SWAYAM-NPTEL platform which are being introduced from session 2023-24 onwards for all the students. The respective Deans / HODs shall provide all the information to all the students pertaining to MOOCs as per details given below:
    1. Deans / HODs shall prepare a list of up to 10 appropriate MOOC courses (From NPTEL Only) of Minimum 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
    2. After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits (only 02) of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
    3. The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean and provide the academic support to students as per requirement.

(b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- The method of assessments of MOOC such as assignments and examinations are completely associated with that particular MOOC and no internal exam (IE component) will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- The center of examination for MOOCs will be finalized by SWAYAM-NPTEL. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- NPTEL will award a certificate to all the students passing the examination.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.
- An ESE Exam of each said MOOC course will also be conducted by the University as per University norms.
- The award of marks/grading will be computed as given below:

Award of marks/grading	Remarks
1. 20% weightage taken from MOOC Certificate +80% weightage taken from ESE Exam of Poornima University **OR** 2. 100% of weightage taken from MOOC Certificate Note: The Higher Marks/Grades of the above two will be considered	The Certificate of MOOC to be Submitted as per date notified by COE, Poornima University

- Any student who would not be able to clear/pass the said course, will be required to appear as a back exam candidate of the University as per PU norms. Students who have not passed the MOOC exam are required to register and participate in the next semester for either the same subject or a similar subject (Ensuring at least 60% of the syllabus matches with the back subject and also approved by respective Dean) offered through NPTEL.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.

- There will be no provision of re-evaluation of MOOC.

NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.

Attached Items:

Ability Enhancement Courses	Annexure-1
Value Added Course Booklet	Annexure-2

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : BSC (PCM) **Duration: 3 years** **Total Credits:142**

Teaching Scheme for Batch 2025-28

Semester-I

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	**Theory**							
25BSACSA1101	Mechanics	3	0	0	40	60	100	3
25BSACSA1102	Organic Chemistry	3	0	0	40	60	100	3
25BSACSA1103	Calculus	3	0	0	40	60	100	3
25BSACSA1104	Vector Calculus and Matrices	3	0	0	40	60	100	3
A.2	**Practical**							
25BSACSA1201	Exploratory Project	0	0	2	60	40	100	1
B.	**Minor Stream Courses/ Department Electives**							
B.1	**Theory**							
25BSAESA1101 25BSAESA1102	Inorganic Chemistry Number Theory	3	0	0	40	60	100	3
B.2	**Practical**							
25BSAESA1201	Chemistry Lab-I	0	0	2	60	40	100	1
25BSAESA1202	Physics Lab-I	0	0	2	60	40	100	1
C	**Multidisciplinary Courses**							
25BSACMC1121	Elementary & Vedic Mathematics	2	0	0	40	60	100	2
D	**Ability Enhancement Courses (AEC)**							
25BEACHM1205	Applied English Communication Skills-I	0	0	2	60	40	100	1
E	**Skill Enhancement Courses (SEC)**							
25BELCSE1201	Skill Enhancement Course-I	0	0	2	60	40	100	1
F	**Value Added Courses (VAC)**							
25BUVCVA1201/ 25BUVCVH1201	Performing Arts/ Universal Human Values and Professional Ethics Lab	0	0	2	60	40	100	1
G	**Summer Internship / Research Project / Dissertation**							
	Nil	0	0	0	0	0	0	0
Total		17	0	12				23
Total Teaching Hours		29						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : BSC (PCM) **Duration: 3 years** **Total Credits:142**

Teaching Scheme for Batch 2025-28

Semester-II

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	**Theory**							
25BSACSA2101	Optics	3	0	0	40	60	100	3
25BSACSA2102	Waves and Oscillations	3	0	0	40	60	100	3
25BSACSA2103	Organic Chemistry	3	0	0	40	60	100	3
25BSACSA2104	Numerical Analysis	3	0	0	40	60	100	3
A.2	**Practical**							
	NIL	0	0	0	0	0	0	
B.	**Minor Stream Courses/ Department Electives**							
B.1	**Theory**							
25BSAESA2101	Differential Equations	3	0	0	40	60	100	3
25BSAESA2102	Inorganic Chemistry							
B.2	**Practical**							
25BSAESA2201	Chemistry Lab-II	0	0	2	60	40	100	1
25BSAESA2202	Physics Lab-II	0	0	2	60	40	100	1
C	**Multidisciplinary Courses**							
25BSAEMC2121	MOOC Course-I	2	0	0	40	60	100	2
D	**Ability Enhancement Courses (AEC)**							
25BEACHM2211	Applied English Communication Skills-II	0	0	2	60	40	100	1
E	**Skill Enhancement Courses (SEC)**							
25BELCSE2201	Skill Enhancement Course-II	0	0	2	60	40	100	1
F	**Value Added Courses (VAC)**							
25BUVCVE2102	Environment & Sustainability	2	0	0	40	60	100	2
25BUVCVH2104	Yoga For Life	2	0	0	40	60	100	2
G	**Summer Internship / Research Project / Dissertation**							
	Nil	0	0	0	0	0	0	0
Total		21	0	8				25
Total Teaching Hours		29						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : BSC (PCM) **Duration: 3 years** **Total Credits: 142**

Teaching Scheme for Batch 2025-28

Semester-III

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	Theory							
25BSACSA3101	Electromagnetism	3	0	0	40	60	100	3
25BSACSA3102	Inorganic Chemistry	3	0	0	40	60	100	3
25BSACSA3103	Physical Chemistry	3	0	0	40	60	100	3
25BSACSA3104	Statistics and Probability Theory	3	0	0	40	60	100	3
A.2	**Practical**							
	NIL	0	0	0	0	0	0	0
B.	**Minor Stream Courses/ Department Electives**							
B.1	**Theory**							
25BSAESA3101	Thermodynamics Statistical Physics	3	0	0	60	40	100	3
25BSAESA3102	Mathematical Modelling							
B.2	**Practical**							
25BSAESA3201	Chemistry Lab-III	0	0	2	60	40	100	1
25BSAESA3202	Physics Lab-III	0	0	2	60	40	100	1
C	**Multidisciplinary Courses**							
25BSAEMC3121	MOOC Course-II	2	0	0	40	60	100	2
D	**Ability Enhancement Courses (AEC)**							
25BEACHM3220	Quantitative And Verbal Aptitude Training-I	0	0	2	60	40	100	1
E	**Skill Enhancement Courses (SEC)**							
25BULCSE3201	Skill Enhancement Course-III	0	0	2	60	40	100	1
F	**Value Added Courses (VAC)**							
25BUVCVA3104	Bharatvarsha: A Land of Rare Natural Endowments	2	0	0	40	60	100	2
G	**Summer Internship / Research Project / Dissertation**							
	Nil	0	0	0	0	0	0	0
Total		19	0	8				23
Total Teaching Hours		27						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : BSC (PCM) **Duration: 3 years** **Total Credits: 142**

Teaching Scheme for Batch 2025-28

Semester-IV

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	**Theory**							
25BSACSA4101	Electronic Devices and Circuits	3	0	0	40	60	100	3
25BSACSA4102	Organic Chemistry	3	0	0	40	60	100	3
25BSACSA4103	Abstract Algebra	3	0	0	40	60	100	3
25BSACSA4104	Optimization Techniques	3	0	0	40	60	100	3
A.2	**Practical**							
	Nil	0	0	0	0	0	0	0
B.	**Minor Stream Courses/ Department Electives**							
B.1	**Theory**							
25BSAESA4101	Analog and Digital Electronics	3	0	0	40	60	100	3
25BSAESA4102	Partial Differential Equations							
25BSAESA4103	Physical Chemistry	3	0	0	40	60	100	3
25BSAESA4104	Analytical Geometry							
B.2	**Practical**							
25BSAESA4201	Chemistry Lab-IV	0	0	2	60	40	100	1
25BSAESA4202	Physics Lab-IV	0	0	2	60	40	100	1
C	**Multidisciplinary Courses**							
25BSAEMC4121	MOOC Course-III	2	0	0	40	60	100	2
D	**Ability Enhancement Courses (AEC)**							
25BEACHM4227	Quantitative And Verbal Aptitude Training-II	0	0	2	60	40	100	1
25BUACHM4223	Public Speaking	0	0	2	60	40	100	1
E	**Skill Enhancement Courses (SEC)**							
25BULCSE4201	Skill Enhancement Course-IV	0	0	2	60	40	100	1
F	**Value Added Courses (VAC)**							
	Nil	0	0	0	0	0	0	0
G	**Summer Internship / Research Project / Dissertation**							
	Nil	0	0	0	0	0	0	0
Total		20	0	10				25
Total Teaching Hours		30						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

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Teaching Scheme for Batch 2025-28

Semester-V

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	**Theory**							
25BSACSA5101	Nuclear Physics	3	0	0	40	60	100	3
25BSACSA5102	Atomic and Molecular Spectroscopy	3	0	0	40	60	100	3
25BSACSA5103	Organic Chemistry	3	0	0	40	60	100	3
25BSACSA5104	Real Analysis	3	0	0	40	60	100	3
A.2	**Practical**							
	Nil	0	0	0	0	0	0	0
B.	**Minor Stream Courses/ Department Electives**							
B.1	**Theory**							
25BSAESA5101	Inorganic Chemistry	3	0	0	40	60	100	3
25BSAESA5102	Analog and Digital Circuits							
B.2	**Practical**							
25BSAESA5201	Chemistry Lab-V	0	0	2	60	40	100	1
25BSAESA5202	Physics Lab-V	0	0	2	60	40	100	1
C	**Multidisciplinary Courses**							
25BSAEMC5121	MOOC Course-IV	2	0	0	40	60	100	2
D	**Ability Enhancement Courses (AEC)**							
25BUACHM5114	Presentation & Interview Skills	2	0	0	40	60	100	2
E	**Skill Enhancement Courses (SEC)**							
25BULCSE5201	Skill Enhancement Course-V	0	0	2	60	40	100	2
F	**Value Added Courses (VAC)**							
	Nil	0	0	0	0	0	0	0
G	**Summer Internship / Research Project / Dissertation**							
25BSACSA5401	Industrial Training & Seminar	0	0	2	60	40	100	3
Total		19	0	8				26
Total Teaching Hours		27						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : BSC (PCM) **Duration: 3 years** **Total Credits: 142**

Teaching Scheme for Batch 2025-28

Semester-VI

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	**Theory**							
25BSACSA6101	Quantum Mechanics	3	0	0	40	60	100	3
25BSACSA6102	Physical Chemistry	3	0	0	40	60	100	3
25BSACSA6103	Complex Analysis	3	0	0	40	60	100	3
A.2	**Practical**							
	Nil	0	0	0	0	0	0	0
B.	**Minor Stream Courses/ Department Electives**							
B.1	Theory							
	Nil	0	0	0	0	0	0	0
B.2	Practical							
	Nil	0	0	0	0	0	0	0
	Nil	0	0	0	0	0	0	0
C	**Multidisciplinary Courses**							
	Nil	0	0	0	0	0	0	0
D	**Ability Enhancement Courses (AEC)**							
25BUACHM6115	Entrepreneurial & Managerial Skills	2	0	0	40	60	100	2
25BUACHM6235	Leadership Communication Lab	0	0	2	60	40	100	1
E	**Skill Enhancement Courses (SEC)**							
25BULCSE6201	Skill Enhancement Course-VI	0	0	2	60	40	100	1
25BULCSE6202	Skill Enhancement Course-VII	0	0	2	60	40	100	2
F	**Value Added Courses (VAC)**							
	Nil	0	0	0	0	0	0	0
G	Nil							
25BSACSA6401	Dissertation	0	0	10	60	40	100	5
Total		11	0	16				20
Total Teaching Hours		27						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : B.Sc.(PCM) **Duration: 4 years** **Total Credits: 174**

Teaching Scheme for Batch 2025-29

Semester-VII

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	Theory							
25BSACSA7101	Mathematical Physics	3	0	0	40	60	100	3
25BSACSA7102	Stereo Chemistry							
25BSACSA7103	Discrete Mathematics							
25BSACSA7104	Solid State Physics	3	0	0	40	60	100	3
25BSACSA7105	Bio- Chemistry							
25BSACSA7106	Linear Algebra							
25BSACSA7107	Research Methodology	3	0	0	40	60	100	3
25BSACSA7208	Writing & Presentation Skills	3	0	0	40	60	100	3
A.2	Practical							
25BSACSA7201	Chemistry Lab-VII	0	0	2	60	40	100	1
25BSACSA7202	Physics Lab-VII							
25BSACSA7204	Data Analysis Using Statistical Package For Social Sciences (SPSS)	0	0	2	0	0	0	1
B.	**Minor Stream Courses/ Department Electives**							
B.1	Theory							
	Nil	0	0	0	0	0	0	0
B.2	Practical							
	Nil	0	0	0	0	0	0	0
C	**Multidisciplinary Courses**							
	Nil	0	0	0	0	0	0	0
D	**Ability Enhancement Courses (AEC)**							
	Nil	0	0	0	0	0	0	0
	Skill Enhancement Courses (SEC)							
	Nil	0	0	0	0	0	0	0
F	**Value Added Courses (VAC)**							
	Nil	0	0	0	0	0	0	0
G	**Summer Internship / Research Project / Dissertation**							
25BSACSA7401	Minor Project-I	0	0	4	0	0	0	2
Total		12	0	8				16
Total Teaching Hours		21						

POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

Name of Program : B.Sc. (PCM) **Duration: 4 years** **Total Credits: 174**

Teaching Scheme for Batch 2025-29

Semester-VIII

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	Theory							
25BSACSA8101	Condensed Matter Physics	3	0	0	40	60	100	3
25BSACSA8102	Organometallic Chemistry							
25BSACSA8103	Sampling Distribution & Hypothesis							
25BSACSA8104	Nanotechnology/	3	0	0	40	60	100	3
25BSACSA8105	Analytical Chemistry/							
25BSACSA8106	Integral transformation							
A.2	Practical							
	Nil	0	0	0	0	0	0	0
B.	**Minor Stream Courses/ Department Electives**							
B.1	Theory							
	Nil	0	0	0	0	0	0	0
B.2	Practical							
	Nil	0	0	0	0	0	0	0
C	**Multidisciplinary Courses**							
	Nil	0	0	0	0	0	0	0
D	**Ability Enhancement Courses (AEC)**							
	Nil	0	0	0	0	0	0	0
	Skill Enhancement Courses (SEC)							
	Nil	0	0	0	0	0	0	0
F	**Value Added Courses (VAC)**							
	Nil	0	0	0	0	0	0	0
G	**Summer Internship / Research Project / Dissertation**							
25BSACSA8401	Research Project-II	0	0	20	0	0	0	10
Total		06	0	20				16
Total Teaching Hours		26						

CORE THEORY

Code: 25BSACSA1101 **MECHANICS** **3.0 Credits [LTP: 3-0-**

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Compare Inertial and non-inertial frames of reference using velocity, acceleration and coordinate system	Understand
CO2	Differentiate among Elastic constants: Young's Modulus, Bulk Modulus, Modulus of Rigidity, Poisson's ratio and bending of beam.	Understand
CO3	Compute center of mass, motion of a system with varying mass and Charged particle scattering by nucleus charged particle scattering.	Apply
CO4	Solve the problems of bodies moving under the central forces using gravitational interaction, Kapler's law and different trajectories.	Apply
CO5	Relate time dilation, length contraction, mass energy relation Lorentz transformation and variation of mass with velocity using Einstein's special theory of relativity.	Understand

B. MAPPING MATRIX OF CO, PO, & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.6	2.8	1.2	-	-	-	-	-	-	-	-	1	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Frames of Reference**	**9**
2.	**Elastic Properties of Matter**	**9**
3.	**Centre of Mass**	**9**
4.	**Motion Under Central Forces**	**9**
5.	**Special Theory of Relativity**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Frames of Reference**
	● Introduction of the Unit ● Inertial and non-inertial frames of references ● Transformation of displacement ● Velocity and acceleration in different coordinate system ● Galilean transformation ● Transformation of velocity and acceleration between rotating frames ● Pseudo forces ● Coriolis force and its application ● Motion relative to earth ● Conclusion of the Unit
2.	**Elastic Properties of Matter**
	● Introduction of the Unit ● Elastic constants: Young's Modulus, Bulk Modulus, Modulus of Rigidity ● Poisson's ratio ● Relations between the elastic constants, torsion of a cylinder ● Bending of beams: Bending moment, Cantilever, ● Principal moments and axes. ● Kinematics of moving fluids, equation of continuity, Euler's equation, ● Bernoulli's theorem. ● Conclusion of the Unit
3.	**Centre of Mass**
	● Introduction of the Unit ● Centre of mass of a two particle system ● Motion of centre of mass and reduced mass conservation of linear momentum ● Elastic and inelastic collision of two particles in laboratory and center of mass frames ● Motion of a system with varying mass ● Angular momentum conservation with examples ● Charged particle scattering by nucleus ● Conclusion of the Unit
4.	**Motion Under Central Forces**
	● Introduction of the Unit ● Motion under central forces ● Gravitational interaction, general solution under gravitational interaction ● Discussion of trajectories ● Cases of elliptical and circular orbits ● Kepler's laws ● Conclusion of the Unit
5.	**Special Theory of Relativity**
	● Introduction of the Unit ● Michelson Morley experiment ● Postulates of special theory of relativity ● Lorentz transformations ● Length contraction ● Time dilation ● Addition of velocities ● Variation of mass with velocity

	● Mass-energy relation ● Relativistic energy-momentum relation ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Elements of Mechanics	Gupta, Prakash and Agrawal	2004	Pragati Prakashan, Meerut
2.	Elements of Mechanics	J.C.Upadhyaya	2006	Himalaya Publishing House
3.	Mechanics	M. P. Saxena, R. P. Singh and S. S. Rawat	2006	CBH

Code: 25BSACSA1102	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Identify the electronic displacements according to bonding, shapes, reactivity and energy consideration of reaction intermediate	Remember
CO2	Classify Hydrocarbons and discuss the methods of preparation of Hydrocarbons.	Understand
CO3	Predict the stability and reactivity of hydrocarbons as per bonding and structure of hydrocarbons.	Understand
CO4	Compare the physical and chemical properties of Hydrocarbons.	Understand
CO5	Describe the applications of various hydrocarbons and their derivatives.	Remember

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	1	2	2	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	1.4	2	2.7	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Fundamentals of Organic Chemistry**	**9**
2.	**Alkanes**	**9**
3.	**Alkenes**	**9**
4.	**Alkynes**	**9**
5.	**Cycloalkanes, Cycloalkenes**	**9**

D. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Fundamentals of Organic Chemistry**
	● Introduction of the Unit ● Electronic displacements: inductive effect, electromeric effect, resonance and hyperconjugation ● Cleavage of Bonds: homolysis and heterolysis ● Structure, shape and reactivity of organic molecules: nucleophiles and electrophiles ● Reactive Intermediates: carbocations, carbanions and free radicals , nitrene, carbene, benzyne, ● Types of organic reactions ● Conclusion & Real life applications
2.	**Alkanes**
	● Introduction of the Unit ● Alkanes:(Upto 5 Carbons) ● IUPAC nomenclature of branched and unbranched alkyl group ● Classification of carbon atoms in alkanes, Physical properties ● Preparation: catalytic hydrogenation, Wurtz reaction, Kolbe synthesis, decarboxylation of carboxylic acid, Grignard reagent, Corey-house reaction ● Reactions: free radical substitution: halogenations ● Conclusion & Real life applications
3.	**Alkenes**
	● Introduction of the Unit ● Alkenes: (Upto 5 Carbons) Preparation: elimination reactions: dehydration of alcohols and dehydrohalogenation of alkyl halides (Saytzeff's rule, Hofmann's elimination ● Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine), addition of HX (Markownikoff's and anti-Markownikoff's addition), hydration, ozonolysis, oxymecuration–demercuration, Hydroboration-oxidation. ● Industrial application of ethylene ● Conclusion & Real life applications
4.	**Alkynes**
	● Introduction of the Unit ● Alkynes: (Up to 5 Carbons) ● Preparation: Acetylene from CaC2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides, acidity of alkynes ● Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ● ozonolysis and oxidation with hot alkaline. KMnO4,hydroboration- oxidation, metal ammonia reduction ● Conclusion & Real life applications
5.	**Cycloalkanes, Cycloalkenes**
	● Introduction of the Unit ● Cycloalkanes: Nomenclature, method of formation, chemical reactions ● Baeyer strain theory and its limitations ● Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings, Mohrs Sachse theory ● The case of cyclopropane ring: banana bond ● Cycloalkenes: Nomenclature, method of formation, chemical reactions ● Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	A Text Book of Organic Chemistry	O. P. Agarwal	Vol. I & II	Latest
2.	A Text Book of Organic Chemistry	B. S. Bahl and ArunBahl	Latest	S. Chand
3.	Organic Chemistry	S. M. Mukherji, S. P. Singh and R. P. Kapoor	Vol. I, II & III	Wiley Eastern Ltd. (New Age International)
4.	Organic Chemistry	Morrison & Boyd	Latest	Prentice Hall

Code: 25BSACSA1103	CALCULUS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Solve mathematical problems using ordinary, partial differentiation equations.	Apply
CO2	Determine the Maxima and Minima of functions of two or more variables and length of arc.	Apply
CO3	Calculate radius of curvature and asymptotes of curves using Cartesian form and polar form.	Apply
CO4	Solve the integration, surface and volume of curves using Beta and Gamma functions.	Apply
CO5	Evaluate double and triple integrals using volume and surface area.	Evaluate

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	1	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	1	1	3	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2	2.4	1.33	3	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Differential Calculus I**	**9**
2	**Differential Calculus II**	**9**
3	**Geometrical Applications of Differential Calculus**	**9**
4	**Integral Calculus**	**9**
5	**Multiple Integrals and Its Applications**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Differential Calculus I**
	● Introduction of the Unit ● Background to the Development of Calculus ● Binomial series expansion ● Partial differentiation ● Euler's theorem on homogeneous functions ● Conclusion of the Unit
2.	**Differential Calculus II**
	● Introduction of the Unit ● The notions of zero and infinity ● Irrationals and iterative approximations. ● Maxima and minima for functions of two or more variables ● Lagrange's method (without proof) ● Conclusion of the Unit
3.	**Geometrical Applications of Differential Calculus**
	● Introduction of the Unit ● Curvature, Radius of Curvature (Cartesian Curves only) ● Asymptotes ● Curve tracing for standard Curves (Cartesian and Polar Curves) ● Conclusion of the Unit
4.	**Integral Calculus**
	● Introduction of the Unit ● Beta and Gamma Functions ● Reduction formulae (simple Standard Formulae) ● Volume and surface of a solid of revolution ● Conclusion of the Unit
5.	**Multiple Integrals and Its Applications**
	● Introduction of the Unit ● Double integral in Cartesian and polar coordinates ● Change of order of integration, ● Triple integral ● Applications of multiple integrals in volume and surface ● Conclusion of the Unit

E. **RECOMMENDED STUDY MATERIAL**:

Sr.No	Reference Book	Author	Edition	Publication
1.	Calculus	H. Anton, I. Birens and S. Davis,	2002	John Wiley and Sons
2.	Calculus	G.B. Thomas and R.L. Finney,	2007	Pearson Education, India
3.	Differential and Integral Calculus	Chandrika Prasad and Gorakh Prasad	1992	Pothishala Pvt. Ltd., Allahabad

Code: 25BSACSA1104	VECTOR CALCULUS AND MATRICES	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Define vectors to perform geometrical calculations in three dimensions.	Remember
CO2	Estimate important features of del operator and its various forms in gradient, divergence and curl.	Understand
CO3	Illustrate Green's theorem, Stokes theorem and the Divergence theorem to compute integrals	Understand
CO4	Discuss the basic concept of matrices and their various properties.	Understand
CO5	Compute the solution of Eigen value and Eigen vectors and inverse of matrix using Cayley Hamilton theorem.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2		-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2.8	2.2	1	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Vector Calculus I**	**9**
2	**Vector Calculus II**	**9**
3	**Vector Calculus III**	**9**
4	**Matrix**	**9**
5	**Eigen Values and Eigen Vectors**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Vector Calculus I**
	● Introduction of Unit ● Scalar and Vector quantity, ● Representation of vectors, Laws of vector additions, ● Product of two vectors, Scalar and vector fields, ● Derivative of a vector function, Velocity and accelerations ● Conclusion of the Unit
2.	**Vector Calculus II**
	● Introduction of Unit ● Del operator, Gradient, Divergence and Curl. ● Directional derivative ● Integration of vectors, ● Line Integral ● Conclusion of the Unit
+3.	**Vector Calculus III**
	● Introduction of Unit ● Surface and Volume Integration. ● Green's, Gauss's and Stokes's theorem(without Proof) and their simple applications ● Conclusion of the Unit
4.	**Matrix**
	● Introduction of Unit ● Types of matrices and elementary operations on matrices ● Rank of a matrix, Normal form ● Consistency of system of linear simultaneous equations (Homogeneous and Non homogeneous) and its solutions ● Conclusion of the Unit
5.	**Eigen Values and Eigen Vectors**
	● Introduction of Unit ● Characteristic equation ● Eigen values and Eigen vectors ● Cayley - Hamilton theorem and its application to find inverse of matrix ● Diagonalization of matrix ● Conclusion of the Unit

E. **RECOMMENDED STUDY MATERIAL**:

Sr.No	Reference Book	Author	Edition	Publication
1.	Vector Calculus	Speigel	5th Edition	Tata McGraw Hill, 1989.
2.	Vector Calculus	J.L Bansal	1989	JPH, Jaipur
3.	Theory and Problems of Matrix Operations	S Richard Bronson	1995	Tata McGraw Hill, 1989.

Code: 25BSACSA1201	EXPLORATORY PROJECT	1.0 Credit [LTP: 0-0-2]

A.**COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING**

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Organize their content into a logical structure with an introduction, main points, and conclusion.	Apply
CO2	Rehearse their presentation multiple times to become familiar with the material and improve your delivery.	Apply
CO3	Analyze UV spectroscopy results and decide its band gap	Analyze
CO4	To understand the writing structure of research paper/ article	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	2	2	-	-	-	-	-	2	2	-	1	3	-	-
CO3	2	2	3	-	-	3	-	1	-	-	-	1	3	-	-
CO4	3	2	1	-	3	-	-	-	-	-	1	1	2	-	-
WT. AVG	2.7	2.2	2.2	-	3	3	-	1	2	2	1	1	2.7	-	-

B. List of Activity

1	Allocation of groups Max. 2 Members & guide
2	Black board presentation on topics as per the choice & feasibility
3	Submission of abstract & synopsis of the project
4	Procurement of the components
5	2D/3D figure or model
6	Paper work like any circuit diagram and tentative cost
7	Final project report submission
8	Final presentation

Code: 25BSAESA1101	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand the atomic structure and periodic properties in explaining the behaviour of elements and compounds.	Understand
CO2	Identify the properties, interaction and energies of compounds with respect to their chemical bonding.	Remember
CO3	Predict the anomalous change in geometry of molecules on account of valence bond theory, VSEPR theory and Molecular orbital Theory.	Understand
CO4	Compare the trends in characteristic properties and synthesis of hydrides of s block and p block elements.	Understand
CO5	Categorize the properties of noble gasses and its compounds with use in daily life applications.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	1	-	3	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	1.4	2	3	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Atomic Structure & Periodic Properties**	**9**
2.	**Ionic Bond, Metallic Bond & Weak Interactions**	**9**
3.	**Covalent Bond**	**9**
4.	**s-Block Elements & p-Block Elements**	**9**
5.	**Chemistry of Noble Gases**	**9**

DETAILED SYLLABUS

Unit	Unit Details
1.	**Atomic Structure & Periodic Properties**
	● Introduction of the Unit ● Bohrs Theory and its limitation ● Heisenberg uncertainty principle ● Quantum number and its Significance ● Aufbau Principle, Hund's multiplicity rule and Pauli's exclusion principle ● Electronic configuration of elements ● Effective nuclear charge and shielding ● Atomic and ionic radii ● Ionization energy ● Electron affinity and electro negativity evaluation ● Conclusion & Real life applications
2.	**Ionic Bond, Metallic Bond &Weak Interactions**
	● Introduction of the Unit ● Ionic bond-General characteristics ● Radius ratio effect and coordination number ● Lattice defects, lattice energy and Born-Haber cycle ● Polarizing power and polarizability ● Fajan's rules ● Conclusion & Real life applications
3.	**Covalent Bond**
	● Introduction of the Unit ● Valence bond theory and its limitations ● Valence shell electron pair repulsion (VSEPR) theory with suitable examples ● Molecular orbital theory ● Bonding, nonbonding and antibonding molecular orbital's ● Linear combination of atomic orbital's (LCAO)-homonuclear and heteronuclear (CO and NO) diatomic molecules. ● Bond strength and bond energy ● Percentage ionic character from dipole moment and electro negativity difference ● Conclusion & Real life applications
4.	**s-Block Elements & p-Block Elements**
	● Introduction of the Unit ● **s-Block Elements -**Comparative study, diagonal relationships ● Solvation and complexation tendencies including their function in biosystems ● Hydride- classification, preparation and characteristics ● **p-Block elements-**Comparative study in periodicity, diagonal relationship ● Hydrides of boron, borazine, carbides, ● Basic properties of halogens, interhalogens and polyhalides ● Conclusion & Real life applications
5.	**Chemistry of Noble Gases**
	● Introduction of the Unit ● Chemical properties of Noble gases ● Chemistry of Xenon ● Structure and bonding in Xenon compound ● Theories of Bonding in noble gases compound ● Conclusion & Real life applications

E.RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication
1	A New Concise Inorganic Chemistry	J. D. Lee	Latest	Chapman & Hall, London
2	Modern Inorganic Chemistry	R. C. Aggarwal	Latest	KitabMahal, Allahabad
3	Basic Inorganic Chemistry	F. A. Cotton, G. Wilkinson, and Paul L. Gaus	Latest	John Wiley & Sons, New York

Code:25BSAESA1102	NUMBER THEORY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Explain the concept of divisibility and able to find greatest common divisor of large integers using Euclidean algorithm	Remember
CO2	Explain applications and definitions of congruence, residue classes and least residues.	Remember
CO3	Apply Euler-Fermat's theorem to prove relations involving prime numbers.	Apply
CO4	Identify certain number theoretic functions and their properties	Understand
CO5	Determine the value of Euler Phi-function and Euler-Phi function for integers	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	1	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	1	2	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	2	-	-	-	-	-	-	-	-	3	-	-
CO5	3	1	2	2	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2	2	3	2	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Division and Euclidean Algorithm**	**8**
2.	**Fundamental Theorem of Arithmetic**	**7**
3.	**Divisibility**	**7**
4.	**Functions**	**8**
5.	**Euler Theorem**	**6**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Division and Euclidean Algorithm**
	● Introduction of the Unit ● The Division Algorithm ● Lame's theorem ● The g.c.d. – The Euclidean Algorithm ● Linear Diophantine Equation ● Conclusion and real life application
2.	**Fundamental Theorem of Arithmetic**
	● Introduction of the Unit ● The Fundamental theorem of arithmetic ● Sieve of Eratosthenes ● The GoldbachConjecture ● Basic properties of congruence ● Conclusion and real life application
3.	**Divisibility**
	● Introduction of the Unit ● Special Divisibility tests ● Linear Congruences ● The Little Fermat's theorem ● Wilson's theorem ● Conclusion and real life application
4.	**Functions**
	● Introduction of the Unit ● The random functions ● The Mobius inversion formula ● The greatest integer function ● Conclusion and real life application
5.	**Euler Theorem**
	● Introduction of the Unit ● Introduction of the Unit ● Euler's Phi – function ● Euler's theorem ● Some properties of the Phi – function ● Conclusion and real life application

E. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication
1	Basic Number Theory	S B Malik	2nd edition	Vikas Publishing House
2	Elementary Number Theory	David M. Burton	2001	Universal Book Stall, delhi
3	Introduction to Analytic Number Theory	T. M. Apostol	1976	Springer Valley, India

Code: 25BSAESA1201	CHEMISTRY LAB-I	1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	Understand
CO2	Impart the students a thorough knowledge of Systematic qualitative analysis of mixtures containing two acid and two basic radicals	Understand
CO3	Develop skills for quantitative estimation using the different branches of volumetric Analysis.	Apply
CO4	Develop skills required for the qualitative analysis of organic compounds	Understand
CO5	Learn and apply basic techniques used in the organic laboratory for preparation, purification and identification of organic compounds.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO5	2	2	3	-	-	-	-	-	-	-	-	1	3	-	-
Wt. Avg	2	2.6	2.6	-	-	-	-	-	-	-	-	1	3	-	-

C. LIST OF EXPERIMENTS

Inorganic Chemistry	
1	To analyze mixture contains two acidic and two basic radicals in a given mixture.
2	To analyze mixture contains two acidic and two basic radicals in a given mixture.
3	To analyze mixture containing three acidic and three basic radicals.
4	To analyze mixture containing three acidic and three basic radicals.
5	To analyze mixture containing three acidic and three basic radicals.
6	Estimation of KMnO4 by oxalic acid.
Organic Chemistry	
7	To detect the functional group from the given organic compound (Alcohol/carbonyl compound).
8	To detect the functional group from the given organic compound (Nitrogen containing compound).
9	To determine the melting point of given organic compound (Naphthalene).
10	To determine the melting point of given organic compound (Urea).
11	To determine the boiling point of given organic compound (Ethanol).
12	To determine the boiling point of given organic compound (Benzene).

Code: 25BSAESA1202	PHYSICS LAB-I	1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Learn the constants of elasticity by the help of different methods	Understand
CO2	Learn the concept of Poisson's ratio and surface tension of water.	Understand
CO3	Learn conversion of Galvanometer to Ammeter and Voltmeter.	Understand
CO4	Learn to evaluate of RLC and CR, DC circuits.	Understand
CO5	Identify and calculate the magnetic field around a current carrying circular coil.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	3	2	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	2	3	3	-	-
CO3	2	3	-	-	-	-	-	-	-	-	2	3	3	-	-
CO4	-	3	-	2	-	-	-	-	-	-	-	3	3	-	-
CO5	3	3	-	-	-	-	-	-	-	-	3	3	3	-	-
Average wt.	2	2.8	-	-	-	-	-	-	-	-	2	2.8	3	-	-

C. LIST OF EXPERIMENTS

1	Determination of Young's modulus using bending of a beam
2	Determine Modulus of rigidity by Maxwell's needle for iron wire
3	Elastic constant by Searle's method
4	To determine the Poisson's ratio of a rubber tube
5	Determination of surface tension of water by Jaegger's method
6	Convert Galvanometer to ammeter into a given range.
7	Convert Galvanometer to voltmeter into a given range.
8	Study of phase relations in CR circuit
9	Study of phase relations in LCR circuit
10	Study of Faraday's Law
11	To determine the modulus of rigidity by statically method.
12	To study the magnetic field along the axis of a current carrying circular coil and find the radius of circular coil.

Code: 25BSACMC1121	ELEMENTARY & VEDIC MATHEMATICS	2 Credits [LTP: 2-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand and apply the properties of number systems and perform conversions between various systems with real-life applications.	Understand
CO2	Analyze and manipulate different types of sets and relations to model and solve mathematical problems.	Analyze
CO3	Analyze and manipulate different types of relations to model and solve mathematical problems.	Apply
CO4	Utilize Vedic techniques to perform basic arithmetic operations efficiently and with speed.	Apply
CO5	Apply Vedic mathematics strategies to solve complex numerical problems, including squaring and finding roots rapidly.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	-	-	-	-	-	-	-	2	3	-	2
CO2	3	3	2	2	-	-	-	-	-	-	1	3	3	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
CO4	3	2	3	3	-	-	-	-	-	-	2	3	3	-	2
CO5	3	2	3	3	-	-	-	-	-	-	2	3	3	-	3
WT. AVG	3	2.4	2	2.2	-	-	-	-	-	-	1.6	2.8	3	-	2.4

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Number System	6
2.	Sets	6
3.	Relations	6
4.	Vedic Mathematics – I	6
5.	Vedic Mathematics – II	6

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Number System**
	• Introduction of Unit • Integers, rational numbers, and real numbers: Definitions, properties, and examples • Number systems: Decimal, Binary, Octal, Hexadecimal • Conclusion &Real-Life Application
2.	**Sets**
	• Introduction of the Unit • Definition and types of sets • Set operations: Union, Intersection, • Difference, Ring Sum, Complement • Conclusion &Real-Life Application
3.	**Relations**
	• Introduction of the Unit • Relations: Definitions, properties, and examples • Types of Relations with simple examples • Injective, Surjective, Bijective functions and compositions • Conclusion &Real-Life Application
4.	**Vedic Mathematics – I**
	• Introduction of the Unit • Addition, Subtraction, Multiplication using Vedic patterns • Techniques for quick mental calculations • Conclusion &Real-Life Application
5.	**Vedic Mathematics – II**
	• Introduction of Unit • Squaring numbers using patterns • Squaring numbers with any number of digits • Calculating square roots and cubes using Vedic methods • Conclusion &Real-Life Application

E. RECOMMENDED STUDY MATERIAL

S. No	Reference Book	Author	Edition	Publication
1.	Discrete Mathematics and Its Applications	Kenneth H. Rosen	Latest	McGraw Hill Education
2.	Vedic Mathematics	Thakur Rajesh Kumar	Latest	Unicorn Books
3.	How To Become A Human Calculator with themagic of Vedic Mathematics	Dr. Aditi Singhal	3rd Edition	S Chand

Code: 25BEACHM1205	APPLIED ENGLISH COMMUNICATION SKILLS-I	1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Develop critical and creative thinking by solving hypothetical problems using limited resources.	Create
CO2	Exhibit persuasive communication and reasoning in debates and decision-making tasks.	Evaluate
CO3	Demonstrate collaboration and interpersonal skills through group-based storytelling and enactments.	Apply
CO4	Enhance public speaking confidence through extempore and stage-based activities.	Apply
CO5	Present innovative ideas and concepts effectively in front of an audience.	Create

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	3	-	1	3
CO2	-	3	3	3	-	-	-	2	-	3	-	2	-	1	3
CO3	-	-	-	-	-	3	-	2	3	3	-	-	-	1	3
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	1	3
CO5	3	3	-	3	3	-	-	-	-	3	-	3	-	1	3
Wt. Avg	3	3	3	3	3	3	-	2	3	3	-	2.7	-	1	3

C. OUTLINE OF THECOURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Collaborative Thinking and Problem-Solving Skills	3
2	Narration, Dialogue, and Group Presentation Skills	3
3	Formal and Impromptu Public Speaking	3
4	Functional and Contextual English Communication	3
5	Creativity, Ideation, and Visual Interpretation	3

LIST OF LABS	
	UNIT 1: Critical Thinking and Survival Communication
1	Team vs Wild – Scenario-based survival task emphasizing teamwork and critical thinking.
2	Who Gets the Heart? – Ethical dilemma debate for persuasive speaking and reasoning.
	UNIT 2: Stage Communication and Public Speaking
3	Debate – Structured argumentative speaking to enhance critical thinking and leadership.
4	Extempore – Impromptu individual speeches to build spontaneity and stage confidence.
5	**Theatrix** – Paired roleplays to practice situational dialogues and collaborative speaking.
	UNIT 3: Storytelling and Visual Communication

6	Story Mason – Group storytelling for stage interaction and creativity.
7	Picture Connector – Visual storytelling by linking images to construct and narrate a cohesive idea.
8	Insane Inventor – Solo presentation of imaginative products to foster innovation and clarity.
	UNIT 4: Real-life English and Functional Conversation
9	Shopping Roleplay – Day-to-day dialogue practice in a simulated shopping scenario.
10	Tourism Pitch – Team-based promotion of a location to enhance descriptive and persuasive communication.
11	Interpersonal Interaction Practice – Real-life communication drills for fluent and functional English usage.
	UNIT 5: Creative Dialogue and Team Presentation

Code: 25BELCSE1201	SKILL ENHANCEMENT COURSES-I	1 Credit [LTP: 0-0-2]

Course: Soft Skills 1

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Demonstrate professionalism through effective use of body language, impression management, and personal branding in academic and workplace settings.	Demonstrate
CO2	Apply skills of habit formation, goal setting, and time management to enhance productivity and achieve personal and professional growth.	Apply
CO3	Collaborate and communicate effectively within teams using convincing skills, ethical reasoning, and awareness of professional responsibilities.	Understand
CO4	Use appropriate grammar structures such as tenses, direct/indirect speech, and voice to construct clear and impactful communication.	Understand
CO5	Enhance written and spoken language using idioms, phrasal verbs, collocations, gerunds, infinitives, and correct punctuation.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	2	-	2	3	3	2	2	-	2	3
CO2	2	2	2	2	1	2	1	2	2	2	3	3	-	2	3
CO3	2	2	2	3	1	3	1	3	3	3	2	3	-	2	3
CO4	1	1	1	2	2	1	-	1	1	3	1	2	-	2	3
CO5	1	1	1	2	2	1	-	1	1	3	1	2	-	2	3
WT AVG	2	1.4	1.4	2.2	1.4	1.8	1	1.8	2	2.8	1.8	2.4	-	2	3

S. No.	Topic	Sub Topic
1	Body Language and Professionalism	Understanding body language helps students communicate more effectively and professionally. This skill enhances their ability to build trust, make positive impressions, and navigate workplace environments with confidence.
2	Habit Formation	By understanding how habits are formed, students can create positive routines that boost productivity and success. This topic empowers them to adopt habits that support their personal and academic growth, while also learning how to break negative habits.
3	Goal Setting	Goal setting helps students stay focused and motivated. By teaching them to set clear, achievable goals, we ensure they have a roadmap for success, whether in their education, career, or personal life.
4	Impression Management	Impression management enables students to present themselves effectively in various social and professional settings. This skill is vital for building strong professional relationships, gaining trust, and achieving career success.
5	Team Building	Team building helps students understand the dynamics of effective collaboration. This topic teaches them how to work together, share responsibilities, and achieve common goals, which are essential skills in almost every workplace.

6	Time Management	Time management skills are essential for students to balance academic workloads, personal life, and professional responsibilities. By teaching them how to prioritize tasks and manage their time effectively, we help them reduce stress and increase productivity.
7	Convincing Skills	Intrapreneurship encourages students to think creatively within an organization, driving innovation and problem-solving. This skill fosters an entrepreneurial mindset that can lead to new opportunities and contributions in any workplace.
8	Ethical Awareness	This module encourages students to recognize and navigate ethical dilemmas in professional settings. It strengthens decision-making with integrity, a quality employers highly value in responsible team members and future leaders.
9	Curiosity and Continuous Learning	Fostering a mindset of curiosity helps students stay relevant in a fast-changing world. This session encourages lifelong learning and adaptability—skills that are vital for growth in any career path.
10	Networking and Personal Branding	Students learn how to build professional relationships and present themselves effectively in-person and online. These skills are essential for career development, visibility, and accessing new opportunities.
11	Tenses	Tense is the skeleton of English language and proper usage of tense forms ensures proper meaning conveyed.
12	Forms and Speech and Voice	Use of direct and indirect speech is essential for speaking ability in English. Voices help in writing convincing and diplomatic sentence/paragraphs.
13	Idioms and Phrasal Verbs	Idioms add flavour and richness to the English language. The author/speakers will sound savvy if idioms and phrasal verbs are appropriately used.
14	Collocations, Gerund and Infinitives	Company of words are called collocations and proper use of collocations brings finesse in one's language. Gerund and infinitives usage helps fine-tune one's language.
15	Punctuations	Improper punctuations in written scripts convey meanings different than the intended one.Writing ability is greatly enhanced by proper usage of punctuations.

Code: 25BUVCVA1201	PERFORMING ARTS	1 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level
CO1	Gain practical exposure to Indian and international dance styles, fostering cultural appreciation and diversity.	Understand
CO2	Develop physical awareness, rhythm, coordination, and stamina through structured training.	Apply
CO3	Learn and perform choreographies across diverse genres, enhancing versatility and adaptability.	Understand
CO4	Enhance stage presence, group dynamics, and body confidence, crucial for performing arts.	Apply
CO5	Create original dance compositions using acquired vocabularies, culminating in a final polished performance and a comprehensive video portfolio.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															
Wt. AVG															

List of Activities

S.No	Activity
1.	Foundations of Movement • Introduction to body alignment, posture, balance, and rhythm • Daily warm-ups, isolations, strength-building, and flexibility training • Introduction to breath and movement synchrony Music and tempo awareness
2.	Indian Folk Dance Practices I (dance styles such as Garba, Ghoomar, Bhangra, Kalbeliya)
3.	Indian Folk Dance Practices II (dance styles such as Garba, Ghoomar, Bhangra, Kalbeliya)
4.	Classical and Semi-Classical Basics I (Bharatanatyam, Kathak, Odissi)
5.	Classical and Semi-Classical Basics II (Bharatanatyam, Kathak, Odissi)
6.	International Groove Sessions I (Basics of Ballroom, Latin Dances, such as Salsa and Cumbia, Bacchata, Contemporary dance, Hip-Hop)
7.	International Groove Sessions II (Basics of Ballroom, Latin Dances, such as Salsa and Cumbia, Bacchata, Contemporary dance, Hip-Hop)
8.	International Groove Sessions III (Basics of Ballroom, Latin Dances, such as Salsa and Cumbia, Bacchata, Contemporary dance, Hip-Hop)
9.	Choreography Lab 1 • Small group choreographies using Indian and global movement vocabularies • Music selection, improvisation games, transitions Peer-to-peer feedback and refinement

10.	Choreography Lab 2 + Performance Skills • Full choreography creation (3–5 min group piece) • Focus on stage presence, projection, entrances/exits Styling, costumes, and syncing with music
11.	Rehearsals and Filming • Rehearsal with stage lighting and mock performance runs On-camera performance practice and professional video shoot
12.	Final Showcase • Public showing or campus performance • Reflection circle and feedback Video portfolio handed over to students

Code: 25BUVCVH1201 UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS L 1 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Identify what is valuable to human beings and what are the aspirations of life.	Understand
CO2	Apply the understanding of value education in solving various problems.	Apply
CO3	Observe and examine the issues related to harmony in self, society, and nature.	Understand
CO4	Focus on physical and mental fitness.	Apply
CO5	Apply the knowledge to their own self and in day-to-day life.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															
Wt. AVG															

LIST OF ACTIVITIES

1	Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them.
2	Now-a-days, there is a lot of talk about many techno-genic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion? On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?
3	Observe that each of us has the faculty of „Natural Acceptance", based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our „Natural Acceptance" and may a time it is also clouded by our strong pre-conditioning and sensory attractions). Explore the following: What is Naturally Acceptable" to you in a relationship the feeling of respect or disrespect for yourself and for others? What is „naturally Acceptable" to you - to nurture or to exploit others? Is your living in accordance with your natural acceptance or different from it?

	2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also, observe how much time & effort you devote to each in your daily routine.
4	1. a. Observe that any physical facility you use, follows the given sequence with time: Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment! 2. List down all your important activities. Observe whether the activity is of „I" or of Body or with the participation of both or with the participation of both „I" and Body. Observe the activities within „i". Identify the object of your attention for different momentss (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.
5	1. Write a narration in the form of a story, poem, skit, or essay to clarify a salient Human Value to the children. 2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.
6	List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature. Analysis and explain the aspect of mutual fulfillment of each unit with other orders.
7	Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basic of natural acceptance of human values? If so, how should one proceed in this direction from the present situation?
8	1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order. 2. Propose a broad outline for humanistic Constitution at the level of Nation.
9	**Project:** Every student required to take-up a social project e.g. educating children in needy/weaker section; services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college.

CODE: 25BSACSA2101	OPTICS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Understanding interference phenomena, including division of amplitude and wavefront, interference in thin films, Newton's rings, and Michelson's interferometer, and their applications.	Understand
CO2	Comprehend the fundamentals of polarization, including different types of polarized light.	Understand
CO3	Understand the theory of laser action, their mechanism with knowledge of different types of lasers as well as various applications of lasers.	Understand
CO4	To grasp the fundamentals of holography, including its principles, distinctions from photography, and applications in microscopy and interferometry, as well as understanding of optical fiber.	Understand
CO5	Comprehend Fraunhofer diffraction phenomena, including diffraction due to a single slit and a plane transmission grating.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO3	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO4	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
Wt. AVG	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Interference**	**9**
2.	**Polarization**	**9**
3.	**Laser and Holography**	**9**
4.	**Holography**	**9**
5.	**Fraunhofer Diffraction**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Interference**
	● Introduction of the Unit ● Division of Amplitude and Division of Wave front ● Interference in Thin Films: Parallel and Wedge-shaped Films ● Fringes of Equal Inclination and Fringes of Equal Thickness ● Newton's Rings: Measurement of Wavelength and Refractive Index ● Michelson's Interferometer and their applications ● Conclusion of the Unit
2.	**Polarization**
	● Introduction of the Unit ● Concept of polarization ● Different kind of polarized lights ● Malus law and Brewster's law ● Double refraction ● Quarter wave and half wave plate ● Production and detection of different polarized lights ● Specific Rotation: Half shade polarimeter ● Determination of specific rotation of sugar solution by polarimeters ● Conclusion of the Unit
3.	**Laser**
	● Introduction of the Unit ● Theory of LASER action: Absorption, spontaneous emission and stimulated emission ● Einstein's coefficients ● Threshold conditions for LASER Action ● Method and Mechanism of production of He-Ne LASER, Semiconductor Laser ● Application of Laser ● Conclusion of the Unit
4.	**Holography**
	● Introduction of the Unit ● Holography versus photography ● Principle of Holography ● Applications of Holography in Microscopy and Interferometry ● Optical Fibre: Principle, construction ● Numerical Aperature Derivation ● Conclusion of the Unit
5.	**Fraunhofer Diffraction**
	● Introduction of the Unit ● Diffraction due to (1) a Single Slit (2) a Plane Transmission Grating ● Characteristics of plane transmission grating

	● Rayleigh's criterion of resolution ● Resolving Power and Dispersive Power of a Plane Diffraction Grating ● Comparison of grating and prism spectra ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Optics	N. Subramanyam and BrijLal	Latest	S. Chand Publication, Delhi
2.	Optics	Ajoy Ghatak	Latest	TMH, New Delhi
3.	Fundamentals of Optics	F. A. Jenkins and Harvey Elliott White	Latest	McGraw-Hill

Code: 25BSACSA2102	WAVES AND OSCILLATIONS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Summarized the simple harmonic motion using equations of motion, such as displacement, velocity, and acceleration as functions of time such as mass-spring systems, pendulums, and LC circuits.	Understand
CO2	Extend the motion of a driven harmonic oscillator using differential equations, including both homogeneous and non-homogeneous solutions and express the role of damping, stiffness, and driving force in these equations.	Understand
CO3	Discuss the energy exchanged between coupled oscillators and how coupling strength affects the dynamics of the system.	Understand
CO4	Classify waves based on various criteria such as their medium of propagation (mechanical waves in solids, liquids, or gases; electromagnetic waves in vacuum or materials) and their nature (transverse or longitudinal).	Understand
CO5	Identify the characteristics of wave propagation, including wave speed, phase velocity, group velocity, and energy transport.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	1	3	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	1	3	-	-
CO5	2	2	3	-	-	-	-	-	-	-	-	1	3	-	-
Wt. AVG	2.4	2.4	1.8	-	-	-	-	-	-	-	-	1	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Simple Harmonic Motion**	**9**
2.	**Driven Harmonic Oscillator**	**9**
3.	**Coupled Oscillator**	**9**
4.	**Wave Motion**	**9**
5.	**Waves in the Bounded Medium**	**9**

D. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Simple Harmonic Motion**
	• Introduction of the Unit • Simple harmonic motion, examples-spring mass system, mass on a spring, torsional oscillator, • LC circuit, energy of the oscillator • Differential equation of simple harmonic motion and its general solution • Damped harmonic oscillator, Mathematical formulation of damped harmonic oscillator, • Energy of damped oscillator, • Power dissipation, Relaxation time, Quality factor of damped harmonic oscillator • Conclusion of the Unit
2.	**Driven Harmonic Oscillator**
	• Introduction of the Unit • Driven harmonic oscillator • Mathematical formulation of driven harmonic oscillator • Frequency response on amplitude and phase • Quality factor of driven oscillator • Resonance • Sharpness of resonance • Power absorption by forced oscillator • Series and parallel LCR circuit • Conclusion of the Unit
3.	**Coupled Oscillator**
	• Introduction of the Unit • Equation of motion of two coupled simple harmonic oscillators • Normal modes • Energy transfer between modes • Electrically coupled circuits (capacitive and inductive) • Effect of coupling and resistive load • Conclusion of the Unit
4.	**Wave Motion**
	• Introduction of the Unit • Plane and Spherical Waves • Longitudinal and Transverse Waves • Plane Progressive (Travelling) Waves • Particle and Wave Velocities • Transverse wave in a stretched string • Velocity of transverse vibrations of stretched strings • Newton's formula for velocity of sound • Laplace's correction • Conclusion of the Unit
5.	**Waves in the Bounded Medium**

	• Introduction of the Unit • Standing (Stationary) waves in a string: Fixed and free ends • Normal modes of stretched strings • Longitudinal standing waves and normal modes • Open and closed pipes • Flow of energy in stationary waves • Phase and group velocities • Conclusion of the Unit

E. **RECOMMENDED STUDY MATERIAL:**

Sr.No	Reference Book	Author	Edition	Publication
1.	Vibrations and Waves	A. P. French	1987	CBS Pub. &Dist
2.	Fundamentals of Waves & Oscillations	K. Uno Ingard	1988	University Press
3.	An Introduction to Mechanics	Daniel K leppner and Robert J. Kolenkow	1973	Tata McGrawHill

Code: 25BESCES2103	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Distinguish between aromatic and antiaromatic compounds by comparing their structures along with their electrophilic aromatic substitution reactions.	Understand
CO2	Explain basic principles of stereochemistry as well as differentiate configuration and conformation, Flying wedge and Fischer projection formula	Remember
CO3	Categorize Nucleophilic Substitution (SN^1, SN^2 and SN^i) reactions with energy profile diagram.	Understand
CO4	Explain the addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reaction, relative reactivities of alkyl, allyl, vinyl and aryl halides.	Understand
CO5	Classify and prepare 1°, 2° and 3° alcohols and demonstrate their reaction.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	1.6	2.2	2.2	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Aromaticity**	**9**
2	**Stereochemistry**	**9**
3.	**Alkyl Halides**	**9**
4.	**Aryl Halides**	**9**
5.	**Alcohols**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Aromaticity**
	● Introduction of the Unit ● Aromaticity: Nomenclature of benzene derivatives. The aryl group, aromatic nucleus and side chain. ● Structure of benzene: Kekule structure. ● Stability and carbon-carbon bond lengths of benzene, resonance structure ● Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples ● Electrophilic aromatic substitution: mechanism, role of sigma and pi-complexes. ● Halogenation, sulphonation, mercuration, Friedel-Crafts reactions and Mechanism of nitration, chloromethylation. ● Energy profile diagrams. Activating and dectivating substituents. ● Directive influence - orientation and ortho/para ratio. ● Conclusion & Real life applications
2.	**Stereochemistry**
	● Introduction of the Unit ● Concept of isomerism ● Types of isomerism ● Difference between configuration and conformation ● Flying wedge and Fischer projection formula ● Properties of enantiomers, chiral and achiral molecules with two stereogeniccentre ● Diastereomers,threo and erythro isomers ● Mesocompounds ● Relative and absolute configuration, sequence rules D and L and R/S system of nomenclature. ● Geometric isomerism-Determination of configuration of geometrical isomers, ; *cis– trans* and E/ Z nomenclature ● Geometric isomerism in oximes ● Conformational isomerism-Newman projection and saw house formula ● Conformational analysis of ethane, n butane and cyclo hexane ● Conclusion & Real life applications
3.	**Alkyl Halides**
	● Introduction of the Unit ● (Upto 5 Carbons) Nomenclature ● Preparation*:* from alkenes *and* alcohols, methods of formation of alkyl halides. ● Reactions: hydrolysis, nitrile &isonitrile formation. Williamson's ether synthesis: Elimination versus substitution ● Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions with energy profile diagram ● Polyhalogen compounds: Chloroform, carbon tetrachloride, DDT, BHC Conclusion & Real life application

4.	**Aryl Halides**

	● Introduction of the Unit ● Aryl Halides Preparation:(Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions ● Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. ● Reactions *(*Chlorobenzene*):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). ● Conclusion & Real life applications
5.	**Alcohols**
	● Introduction of the Unit ● Alcohols: Classification and Nomenclature**.** ● Monohydric Alcohols-Preparation*:* Preparation of 1º, 2º and 3º alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters,Hydogen bonding, Acidic Nature ● Reactions*:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acidic dichromate, conc. HNO3), Oppeneauer oxidation ● Conclusion & Real life applications

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	A Text Book of Organic Chemistry	K. S. Tiwari, S. N. Mehrotra and N. K. Vishnoi	Latest	Vikas Publishing House
2.	Modern Principles of Organic Chemistry	M. K. Jain & S. C. Sharma	2015	Vishal Publishing Co
3	A Text Book of Organic Chemistry	B. S. Bahl and ArunBahl	Latest	S. Chand
4	Organic Chemistry	S. M. Mukherji, S. P. Singh and R. P. Kapoor	Vol. I, II & III	Wiley Eastern Ltd. (New Age International)
5	Organic Chemistry	Morrison & Boyd	Latest	Prentice Hall

CODE: 25BSACSA2104	NUMERICAL ANALYSIS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Solve equal and unequal intervals for Interpolation problem.	Apply
CO2	Apply numerical methods to obtain approximate solutions to mathematical problems.	Apply
CO3	Solve the linear simultaneous equations using numerical methods	Apply
CO4	Solve the transcendental and algebraic equations using Secant, Regula Falsi, Successive iteration method, Newton-Raphson etc.	Apply
CO5	Analyze the numerical methods to solve differential equations.	Analyze

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	1	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	3	1	2	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2	2.8	1.33	2	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Interpolation**	**9**
2	**Numerical Differentiation and Integration**	**9**
3	**Numerical Solution of Linear Simultaneous Equations**	**9**
4	**Numerical Solution of Algebraic and Transcendental Equations**	**9**
5	**Numerical Solution of Ordinary Differential Equations**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Interpolation**
	● Introduction of the Unit ● Interpolation: Differences, relation between differences and derivatives. ● Newton's formulae for forward and backward interpolation, ● Sterling's formula, Divided difference, Newton's divided difference, ● Lagrange's interpolation formula ● Conclusion of the Unit
2	**Numerical Differentiation and Integration:**
	● Introduction of the Unit ● Numerical differentiation simple methods, ● Numerical integration: Derivation of General Quadrature formulas, ● Trapezoidal rule, Simpson's one third and Simpson's three eighth rule, ● Gauss Quadrature Formulae ● Conclusion of the Unit
3	**Numerical Solution of Linear Simultaneous Equations**
	● Introduction of the Unit ● Solution of linear simultaneous equations: ● Direct methods - Gauss elimination ● Gauss-Jordan ● LU decomposition ● Gauss-Seidel method ● Conclusion of the Unit
4	**Numerical Solution of Algebraic and Transcendental Equations:**
	● Introduction of the Unit ● Solution of algebraic and transcendental equations using ● Bisection method ● Secant method ● Regula Falsi method ● Successive iteration method, ● Newton-Raphson method ● Conclusion of the Unit
5	**Numerical Solution of Ordinary Differential Equations**
	● Introduction of the Unit ● Solution of ordinary differential equations of first order with initial condition using ● Picard's method ● Euler's and Modified Euler's methods ● Runge-Kutta method of fourth order ● Milne Predictor Corrector method ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Numerical Methods for Scientific and Engineering Computation	M.K. Jain, S.R.K. Iyengar and R.K. Jain	2000	New age International Publisher, India, 2007.
2.	Numerical Methodsin Engineering & Science,	B. S. Grewal ,	2007	Khanna Publication
3.	Numerical Methods	Balaguruswamy	1992	TMH, India

Code: 25BSAESA2101	DIFFERENTIAL EQUATIONS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Identify the type of a given differential equation, select, and apply the appropriate analytical technique for finding the solution.	Understand
CO2	Solve the first order and higher degree differential equations solvable for x, y, p, Clairaut's form and orthogonal trajectories.	Apply
CO3	Solve linear differential equations with constant coefficients, linear simultaneous differential equations and Cauchy-Euler equation.	Apply
CO4	Determine the complete solutions to the linear equations of second order.	Understand
CO5	Explain the order and degree of partial differential equations and their solutions.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**First order and First Degree Differential Equations**	**9**
2	**First Order and Higher Degree Differential Equations**	**9**
3	**Higher Order and Simultaneous Linear Differential Equations**	**9**
4	**Second Order Linear Differential Equation with Variable Coefficients**	**9**
5	**Partial Differential Equations**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1	**First order and First Degree Differential Equations**
	• Introduction of the Unit • Degree and order of Differential equation • Variable separation, Homogeneous, • Linear equations and equations reducible to linear form. • Exact Differential equation and reducible to exact • Conclusion of the Unit
2	**First Order and Higher Degree Differential Equations**
	• Introduction of the Unit • First order and higher degree equations solvable for *x, y, p.* • Clairaut's form and singular solutions. • Orthogonal trajectories. • Conclusion of the Unit
3	**Higher Order and Simultaneous Linear Differential Equations**
	• Introduction of the Unit • Higher order linear differential equation with constant coefficients Linear • Simultaneous differential equations • Conclusion of the Unit
4	**Second Order Linear Differential Equation with Variable Coefficients**
	• Introduction of the Unit • Linear differential equation of second order: • Homogeneous equation, Exact equation • Change of dependent variable and independent variable method • Method of variation of parameters • Conclusion of the Unit
5	**Partial Differential Equations**
	• Introduction of the Unit • Order and degree of a partial differential equation • Linear partial differential equation of first order: Lagrange's method • Standard forms and Charpit's method • Classification of second order partial differential equations into elliptic, parabolic and hyperbolic (simple concept only) • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Differential Equations,	Shepley L. Ross,	3rd Edition 1984	John Wiley and Sons, India
2.	Elements of Partial Differential Equations	I. Sneddon	1967	McGraw-Hill, International Edition India
3.	Schaum outline of Differential Equation,	Richard Bronson, Gabriel Costa,	third edition 2001	TMH India

Code: 25BSAESA2102	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Explain the fundamental concepts of industrial chemistry, raw materials, and industrial operations used in large-scale chemical manufacturing.	Remember
CO2	Classify various types of fuels and evaluate their properties, uses, and energy content, including modern energy alternatives.	Apply
CO3	Understand the production and applications of industrial gases and demonstrate knowledge of water treatment methods used in industries.	Understand
CO4	Describe the manufacturing processes of important inorganic chemicals and interpret industrial flow charts and reaction mechanisms.	Understand
CO5	Apply knowledge of safety protocols, pollution control, and environmental management systems in the context of chemical industries.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Introduction to Industrial Chemistry & Raw Materials**	**9**
2	**Fuels and Energy Sources**	**9**
3	**Industrial Gases and Water Treatment**	**9**
4	**Chemical Industries and Processes**	**9**
5	**Safety, Pollution, and Environmental Management**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to Industrial Chemistry & Raw Materials**
	• Introduction of the Unit • Definition, scope, and importance of Industrial Chemistry • Classification of industries: primary, secondary, and tertiary • Raw materials: renewable and non-renewable resources • Basic requirements of an industry: land, labor, capital, energy, water, and waste disposal • Unit operations and unit processes – basic concepts • Flow diagrams and block diagrams in industrial processes • Conclusion of the Unit
2	**Fuels and Energy Sources**
	• Introduction of the Unit • Classification of fuels: solid, liquid, and gaseous fuels • Calorific value: gross and net • Characteristics of good fuel • Coal: types, carbonization, by-products of coking • Petroleum: refining, cracking (thermal and catalytic), reforming • Alternative energy sources: solar, wind, nuclear, biofuels • Conclusion of the Unit
3	**Industrial Gases and Water Treatment**
	• Introduction of the Unit • Manufacturing and industrial applications of: • Hydrogen • Oxygen • Nitrogen • Carbon dioxide • Ammonia • Water for industrial use: sources and types of impurities • Hardness of water: causes and units • Water softening methods: lime-soda, zeolite, ion exchange • Boiler feed water: problems and treatment • Industrial effluents and waste water treatment • Conclusion of the Unit
4	**Chemical Industries and Processes**

	• Introduction of the Unit
	• Manufacturing processes (flow charts, raw materials, reactions, by-products, applications):
	  ◦ Sulphuric acid (Contact process)
	  ◦ Nitric acid (Ostwald process)
	  ◦ Ammonia (Haber process)
	  ◦ Sodium carbonate (Solvay process)
	  ◦ Cement (wet and dry process)
	• Green chemistry: principles and industrial relevance
	• Conclusion of the Unit

5	**Safety, Pollution, and Environmental Management**
	• Introduction of the Unit • Industrial hazards: fire, explosion, chemical hazards

	● Safety management: labels, MSDS, PPE, and emergency protocols ● Air and water pollution: sources and control ● Environmental laws related to industries (overview of EPA, EIA, ISO standards) ● Sustainable and cleaner production techniques ● Waste management: reuse, recycling, disposal methods ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Differential Equations,	Shepley L. Ross,	3rd Edition 1984	John Wiley and Sons, India
2.	Elements of Partial Differential Equations	I. Sneddon	1967	McGraw-Hill, International Edition India
3.	Schaum outline of Differential Equation,	Richard Bronson, Gabriel Costa,	third edition 2001	TMH India

Code: 25BSAESA2201	CHEMISTRY LAB-II	1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Describe the physical and chemical properties of common organic functional groups	Understand
CO2	Understand the concept of separating the mixture.	Understand
CO3	Demonstrate instrumental analysis techniques in chemistry.	Apply
CO4	Understand the concept of surface tension and viscosity.	Understand
CO5	Understand the states of matter	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO5	2	2	3	-	-	-	-	-	-	-	-	1	3	-	-
WT. AVG.	2	3	2.6	-	-	-	-	-	-	-		1	3	-	-

C. LIST OF EXPERIMENTS

Organic Chemistry	
1	To determine the functional group and identify the given organic compound.
2	To determine the functional group and identify the given organic compound.
3	To determine the functional group and identify the given organic compound.
4	To crystallize s acetanilide from hot water
5	To purify the given organic mixture by Sublimation
6	To separate the mixture (1 solid+1 liquid) by distillation.
Physical Chemistry	
7	To determine the surface tension of the pure liquid (alcohol etc.) with the help of Stalagmometer.
8	To determine the viscosity of the given liquid with the help of viscometer.
9	To determine critical solution temperature and composition of phenol water system.
10	To determine the percentage composition of a given mixture (non-interacting system) by viscosity method/ surface tension method.
11	Estimation of Fe(II) with K2Cr2O7 using internal indicator (diphenylamine, N- phenylanthranilic acid) and discussion of external indicator.
12	Estimation of sodium carbonate using standardized HCl.

Code: 25BSAESA2202	PHYSICS LAB-II	1.0 Credit [LTP: 0-

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Learn the concept of interference by the help of Newton's ring & Michelson Interferometer	Understand
CO2	Learn the phenomenon of polarization and diffraction through biquartz polarimeter & Grating respectively	Understand
CO3	Learn the dispersive power of the material of the prism & resolving power of the telescope	Understand
CO4	Learn the concept of De-Sauty Bridge, phenomenon of charging & discharging & Lissajous figures.	Understand
CO5	Understand the characteristics of LR circuit with the source of constant emf and AC power source.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	3	2	3	-	-
CO2	2	-	-	-	-	-	-	-	-	-	2	-	3	-	-
CO3	3	2	-	-	-	-	-	-	-	-	3	2	3	-	-
CO4	2	3	-	-	-	-	-	-	-	-	2	3	3	-	-
CO5	3	3	-	-	-	-	-	-	-	-	3	3	3	-	-
Wt. Avg	2.6	2.5	-	-	-	-	-	-	-	-	2.6	2.5	3	-	-

C. LIST OF EXPERIMENTS:

1.	Specific rotation of sugar solution by biquartzpolarimeter
2.	Wavelength of sodium light by Michelson's Interferometer
3.	Wavelength of mercury light by plane transmission grating.
4.	Wavelength of sodium light by Newton's ring method.
5.	Dispersive power of material of prism by spectrometer
6.	Verification of Malus law
7.	Resolving power of a Telescope
8.	Measurement of capacitance by De-Sauty bridge
9.	Study of charging and discharging of CR circuit
10.	Study of phase and frequency by using CRO (Lissajous figures)
11.	To study the rise and decay of current in an LR circuit with a source of constant emf.
12.	To study the voltage and current behavior of an LR circuit with an AC power source. Also, determine power.

Code: 25BEACHM2211 APPLIED ENGLISH COMMUNICATION SKILLS-II 1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Demonstrate effective verbal and written communication in professional contexts.	Analyze
CO2	Create impactful visual and written content using digital tools.	Create
CO3	Apply business vocabulary and networking strategies in professional interactions.	Understand
CO4	Analyse and respond to organizational and marketing communication challenges.	Evaluate
CO5	Demonstrate competence in client-facing, freelance, and personal branding skills.	Evaluate

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	1	-	2	2	3	2	2	-	1	1
CO2	1	1	1	2	3	1	-	2	2	3	2	2	-	1	1
CO3	1	2	1	2	2	2	-	2	2	3	2	2	-	1	1
CO4	2	2	2	3	2	2	1	2	2	3	2	2	-	1	1
CO5	1	2	1	2	2	2	-	3	3	3	2	2	-	1	1
Wt. AVG	1.4	1.6	1.2	2.2	2	1.6	1	2.2	2.2	3	2	2	-	1	1

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Foundations of Professional Communication	3
2	Communication through Visual Tools	3
3	Professional Writing and Market Communication	3
4	Organizational Communication and Events	3
5	Personal Branding and Freelance Communication	3

D. **DETAILED SYLLABUS**

LIST OF LABS	
	Unit I – Foundations of Professional Communication
	Introduction to the Course & Getting Started – Overview, expectations, engagement strategies.
	Semantics for Professional Speech – Word choice, tone, clarity, and context in communication.
	Business Vocabulary – Part 1 – Workplace terms, expressions, and professional tone.
	Unit II – Communication through Visual Tools
	Design Essentials – Canva – Basics of visual content creation using Canva.
	Design Essentials – Microsoft PowerPoint – Effective slide design, animation, and multimedia use.
	Design Essentials – Paste, Prezi & Other Tools – Exploration of dynamic and interactive presentation platforms.
	Unit III – Professional Writing and Market Communication
	Report Writing – Structure, clarity, and objectivity in professional reporting.
	Proposal Writing – Persuasive writing for project and funding proposals.
	Digital Marketing – Email Newsletters & social media – Targeted communication, platform-specific strategies.
	Unit IV – Organizational Communication and Events
	Networking 101 – Building professional relationships and connections.
	Event Management – Planning, coordination, and execution of events.
	Intra-Organization Communication – Case Studies – Internal communication systems, case-based analysis.
	Unit V – Personal Branding and Freelance Communication
	Personal Branding & Impression Management – Crafting a personal image for career and social platforms.
	Nuts and Bolts of Freelance Work – Contracts, client management, freelance structures.
	Nuts and Bolts of Client-facing Work – Etiquette, service professionalism, and conflict handling.

CODE: 25BELCSE2201	SKILL ENHANCEMENT COURSES-II	1.0Credit [LTP: 0-0-2]

Course: Soft Skills -2

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome (CO):	At the end of this course, Student will be able to:	Bloom Level
CO1	Prepare a strong professional profile including resume writing, personal branding, and mock interview practices to enhance employability.	Understand
CO2	Apply research, analytical, and critical thinking skills for informed decision-making and effective problem-solving in academic and professional contexts.	Apply
CO3	Design and evaluate business models through idea generation, product planning, marketing strategies, and financial planning.	Apply
CO4	Present business ideas effectively using structured business plans and pitching techniques in simulated or real entrepreneurial settings.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	2	-	2	3	3	2	3	-	1	3
CO2	2	3	3	3	2	1	1	2	2	2	2	3	-	1	3
CO3	2	2	2	3	2	2	1	2	3	2	3	3	-	1	3
CO4	2	2	2	2	2	2	-	2	3	3	3	2	-	1	3
WT. AVG	2	2	2	2.2	2	1.75	1	2	2.75	2.5	2.5	2.75	-	1	3

C. DETAILED SYLLABUS

S. No.	Topic	Sub Topic
1	Group discussion	Importance of GD Dos and Donts GD topic types Idea generation techniques One mock GD with 12 volunteers, facilitated by the trainer
2	Personal Interview	Self introduction – Practice Body language for interviews FAQ discussion
3	Resume writing	Important aspects of a good resume Sample template and formatting ideas
4	Group discussion – Mock	Mock GDs – 5 GDs with 12 members in a GD Each GD for 15 minutes Detailed feedback after each GD by the trainer

5	Personal interview – Mock	A snapshot of what happens in a 3 hour session – The process detailed below is repeated for every session with students shuffling between trainers 1 and 2. Personal interview mock (for 15 students) by trainer 1: · Mock PI for each candidate · Individual feedback and areas of improvement · Simulation of an actual interview experience Personal interview practice (for the remaining 45 students) by trainer 2: · Students made to perfect their answers to FAQs · Interview-role play activity · Extempore
6	Research Skills and Information Literacy	This session equips students with tools to find, evaluate, and use information critically. In an era of information overload, these skills are vital for academic success, innovation, and informed decision-making.
7	Social Awareness & Relationship Management	This module builds emotional intelligence, helping students understand others' perspectives and manage interactions constructively. It enhances teamwork, leadership, and conflict resolution—core components of professional effectiveness.
8	Spotting a Business Opportunity	Introduction to entrepreneurship Idea generation Ideas to opportunities Innovation in entrepreneurship Case studies
9	Planning Your Product and Company	Creating a thorough market research Product Conceptualization and Development Plan Case studies
10	Exploring Business Model	Types of Business Models Value Proposition Revenue Streams and Cost Structure Channels and Distribution
11	Marketing and Branding	Sales, Marketing and Branding Marketing mix Target segmentation Types of marketing used CRM Case studies
12	Financial Planning and Budgeting	Financing the business Fundraising techniques Investors and stages
13	Business Plan and Pitching	Creating a business plan Pitching Types of pitching and how to do them
14	Pitch Event and Product Launch	Final pitch event where participants present their business ideas to a panel of judges, investors, or potential customers.
15	Email Writing	Helps participants write clear and professional emails with the right tone and structure. Covers greetings, body, closings, and common errors to avoid. Includes real-life practice for confident workplace communication.

CODE: 25BUVCVE2102	ENVIRONMENT AND SUSTAINABILITY	2.0 Credits [LTP: 2-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, Student will be able to:	Bloom Level
CO1	Understanding of the concept of sustainable development	Understand
CO2	Classification of energy resources depending upon their origin and their conservation	Apply
CO3	Understanding of the Disaster Management	Apply
CO4	Summarize social issues related to population, resettlement and rehabilitation of project affected persons	Understand
CO5	Understanding of the local environmental assets with simple ecosystems and identify local flora and fauna.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	–	–	–	–	3	2	–	–	-	1	–	–	-
CO2	2	3	2	–	–	–	3	2	–	–	1	1	–	–	1
CO3	1	2	–	–	–	–	2	3	–	–	-	1	–	–	1
CO4	1	2	–	–	2	–	3	2	–	–	-	1	–	–	-
CO5	1	–	2	2	–	–	2	1	–	–	-	1	–	–	1
WT AV G	1.4	2	2	2	2	-	2.6	2	-	-	1	1	-	–	1

C. OUTLINEOFTHECOURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction of Sustainable Development Concept**	**6**
2.	**Energy Resources and Conservation**	**6**
3.	**Disaster Management**	**6**
4.	**Role of Environment in Human Society**	**6**
5.	**Field Work**	**6**

D. . DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction of Sustainable development concept**
	• Introduction of Unit • Concept of sustainability and sustainable development. • Ecosystem: Structure and function of ecosystem • Energy flow in an ecosystem: food chains, food webs and ecological succession. • Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems • Biodiversity and Conservation • Conclusion & Real Life Application
2.	**Energy Resources and Conservation**
	• Introduction of Unit • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. • International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD) • Conclusion & Real Life Application
3.	**Disaster Management**
	• Introduction of the Unit • Disaster management: floods, earthquake, cyclones and landslides. • Climate change, global warming, ozone layer depletion • Acid rain and impacts on human communities and agriculture • Conclusion & Real Life Application
4.	**Role of Environment in Human Society**
	• Introduction of Unit • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Conclusion & Real Life Application
5.	**Field Work**
	• Introduction of Unit • Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. • Study of common plants, insects, birds and basic principles of identification. • Study of simple ecosystems-pond, river, dissert etc. • Conclusion & Real Life Application

E. . RECOMMENDEDSTUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Natural Resource Conservation – Management for Sustainable Future	Owen, O.S, Chiras, D.D, &Reganold, J.P.	1998	Prentice Hall.
2.	Fundamentals of Materials for Energy and Environmental Sustainability.	Ginley, D.S. &Cahen, D	2011	Cambridge University Press.
3.	Environmental Science.	Miller, T.G.	2012	Wadsworth Publishing Co
4.	Conservation of Natural Resources	Klee, G.A	2001	Prentice Hall Publication.

Code: 25BUVCVH2104	YOGA FOR LIFE	2.0 Credits [LTP: 2-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, Student will be able to:	Bloom Level
CO1	Understanding ways to harmonize the body and mind through Yoga	Understand
CO2	Disciplining the traditional yoga texts	Understand
CO3	Understanding of Beginner exercises in yoga	Apply
CO4	Understand the value of traditional Surya namaskar	Apply
CO5	Understand the value of Yoga for holistic living, Personality Development	Understand

B. MAPPING MATRIX OF CO, PO, & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
CO2	-	-	-	-	-	-	-	1	-	-	-	3	-	-	3
CO3	-	-	-	-	-	-	-	-	-	-	-	2	-	-	3
CO4	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
CO5	-	-	-	-	-	-	-	-	1	-	-	2	-	-	3
WT. AVG	-	-	-	-	-	-	-	1	1	-	-	2.6	-	-	3

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction to Yoga	6
.	Introduction to Yogic texts	6
3.	Yogic Sukshma Vyayama	6
4.	Yogic Sthula Vyayama & Surya Namaskar	6
5.	Yogasana & Pranayama	6

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Yoga**
	● Introduction of the Unit ● Yoga Etymology , definition, Aim ,Objective ● Misconception Significance of Asana ● Yoga its origin , History & Development ● Conclusion & Real life application
2.	**Introduction to Yogic texts**
	● Introduction of the Unit ● Patanjali's Yogasutra ● Hatha Pradeepika ● Conclusion & Real life applications
3.	**Yogic Sukshma Vyayama**
	● Introduction of the Unit ● Basics of Sukshma vyayama ● Types of Sukshma Vyayama ● Benefits of Sukshma Vyayama ● Conclusion & Real life applications
4.	**Yogic Sthula Vyayama & Surya Namaskar**
	● Introduction of the Unit ● Types of Sthula vyayama ● Introduction to surya namaskar ● Surya namaskar with Mantra ● Conclusion & Real life applications
5.	**Yogasana & Pranayama**
	● Introduction of the Unit ● Introduction to nutrition for physical fitness and sport ● Feeding problems in children with special needs ● Considerations during natural and man-made disasters e.g. floods, war.- basic guidelines in disaster management ● Conclusion of the unit

E. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Quality Council of lndia	Yoga professionals Official Guidebook for Level 2	2016	Excel Books, New Delhi
2.	Patanjali Yogasutras	Commentry by Swami Vivekanand	2015	Rajyoga
3.	Hatha Pradeepika	Sahay G. S.	2013	MDNIY, New Delhi,
4.	Yogic Suksma Vyayama,	Brahmachari Swami Dhirendra	1986	Dhirendra Yoga Publications, New Delhi,
5.	Quality Council oflndia	Yoga professionals Official Guidebook for Level 2	2016	Excel Books, New Delhi

Code:25BSACSA3101	ELECTROMAGNETISM	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Apply Coulomb's law to solve problems related to electric fields, forces between charged particles.	Apply
CO2	Explain insight into the relationship between electric susceptibility and atomic polarizability.	Understand
CO3	Explain the orbital gyro magnetic ratio, which relates the angular momentum of an electron's orbital motion to its magnetic moment, and understand its significance in describing the behavior of magnetic moments in atomic and molecular systems.	Understand
CO4	Analyze the behavior of dielectric materials in response to an applied electric field, including polarization mechanisms such as electronic polarization, ionic polarization, and orientation polarization.	Analyze
CO5	Investigate the behavior of electromagnetic waves propagating through non-conducting dielectric mediums, including the effects of material properties such as permittivity and permeability on wave propagation	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.6	2.8	1.5	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Scalar and Vector Fields**	**9**
2.	**Electric Field in Matter**	**9**
3.	**Magnetic Fields in Matter**	**9**
4.	**Dielectric**	**9**
5.	**Maxwell's Equations and Electromagnetic Waves**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Scalar and Vector Fields**
	● Introduction of the Unit ● Coulomb's law, Gauss's law. ● Gradient of a scalar function, Vector Flux ● Divergence of a vector function ● Line Integral of vector field ● Curl of vector function ● Physical significance of curl ● Gauss divergence theorem ● Stoke's theorem ● Poisson's and Laplace's equations ● Solution of Laplace's equation for simple cases. ● Conclusion of the Unit
2.	**Electric Field in Matter**
	● Introduction of the Unit ● The moment of a charge distribution. ● Atomic and molecular dipoles. ● Atomic polarizability. ● Permanent dipole moment, dielectrics. ● The Capacitor filled with a dielectric. ● The potential and field due to a polarized sphere. ● Conclusion of the Unit
3.	**Magnetic Fields in Matter**
	● Introduction of the Unit ● Electric current due to orbital electron, the field of current loop, Bohr magneton. ● Orbital gyro magnetic ratio Electron spin and magnetic moment. ● Magnetic susceptibility, magnetic field caused by magnetized matter. ● Magnetization current. Free current and the field H. ● Conclusion of the Unit
4.	**Dielectric**
	● Introduction of the Unit ● Dipole moment and Polarization ● The microscopic concept of polarization ● Internal field or local fields in liquids and solids ● Clausius-Mosotti Relation and its significance ● Relation between dielectric constant and the refractive index (Lorentz-Lorenz Formula) ● The bound charge (polarization) current. ● Conclusion of the Unit
5.	**Maxwell's Equations and Electromagnetic Waves**

	● Introduction of the Unit ● Introduction to nutrition for physical fitness and sport ● Feeding problems in children with special needs ● Considerations during natural and man-made disasters e.g. floods, war.- basic guidelines in disaster management ● Conclusion of the unit

E. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publication
1.	Electromagnetism	M.P. Saxena, S.S. Rawat and P. R. Singh	2015	CBH, Jaipur
2.	Electricity and Magnetism with Electronics	K.K. Tiwari	1996	S. Chand Publication, Delhi
3.	Electricity and Magnetism	A.S. Majahan and A.A. Rangwala	1997	TMH, Delhi

Code: 25BSACSA3102	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Describe the unique properties, coordination behavior, and oxidation states of d-block elements	Understand
CO2	Analyze the chemistry of coordination compounds	Understand
CO3	Describe the electronic configuration, atomic radii, ionic radii, oxidation state of lanthanides and their separation	Apply
CO4	Describe Actinides; learn the separation techniques of trans- uranium elements.	Analyze
CO5	Understand the basic principle of crystallization, distillation, solvent extraction, TLC and column chromatography	Remember

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	-	3	-	-
CO4	2	3	2	1	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2		-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2.6	2.6	2.0	1.3	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Transition Metals**	**9**
2.	**Coordination Compounds**	**9**
3.	**Lanthanides**	**9**
4.	**Actinide**	**9**
5.	**Separation Techniques and Chromatography**	**9**

D. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Transition Metals**
	● Introduction to the Unit ● Characteristic Properties of d-Block Elements ● Properties of the Elements of the First Transition series ● Relative Stability of their Oxidation States ● Coordination number and Geometry ● Conclusion & real life application
2.	**Coordination Compounds**
	● Introduction to the Unit ● Coordination Compounds: Werner's theory, nomenclature, chelates, stereo-chemistry of coordination numbers 4, 5 and 6. ● Nomenclature and isomerism in coordination complexes. ● Important applications of coordination compounds. ● Theories of metal-ligand bonding in transition metal complexes- Sidgwick effective atomic number concept, ● valence bond theory of coordination compounds ● Conclusion & real life application
3.	**Lanthanides**
	● Introduction to the Unit ● **Lanthanides:** Comparative study of lanthanide elements with respect to electronic configuration, atomic and ionic radii, oxidation state and complex formation. ● Lanthanide contraction. Occurrence and principles of separation of lanthanides. ● General features and chemistry of Lanthanides ● Conclusion & real life application
4.	**Actinides**
	● Introduction to the Unit ● Actinides: Comparative study of actinide elements with respect to electronic configuration, atomic and ionic radii, oxidation states and complex formation; ● Occurrence and principles of separation. ● General features and chemistry of actinides, principles of separation of Np, Pu and Am from ● U. Trans-Uranium elements ● Comparison of Lanthanides and Actinides ● Conclusion & real life application
5.	**Separation Techniques and Chromatography**
	● Introduction to the Unit ● Separation Techniques: Principles and process of solvent extraction ● the distribution law and partition coefficient, batch extraction, continuous extraction and counter current distribution ● Gravimetric methods, theory of precipitation, co-precipitation, post precipitation, theory of purifying the precipitates ● Chromatography: Classification of chromatographic methods, Ion-exchange, thin layer and paper chromatography ● Conclusion & real life application

E. **RECOMMENDED STUDY MATERIAL:**

Sr. No.	Reference Book	Author	Edition	Publication
1.	A New Concise Inorganic Chemistry	J. D. Lee	5th Edition	Chapman & Hall, London
2.	Modern Inorganic Chemistry	R. C. Aggarwal	1st Edition	KitabMahal, Allahabad
3.	Basic Inorganic Chemistry	F. A. Cotton, G. Wilkinson, and Paul L. Gaus	3rd Edition	John Wiley & Sons, New York

Code: 25BSACSA3103	PHYSICAL CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Determine structure of compounds by X ray diffraction methods and compare the chemical behavior and physical properties of common substances.	Understand
CO2	Apply the concept of liquid crystals in applications of advanced technologies.	Apply
CO3	Differentiate real gases from ideal gases at different temperature and pressure and explain methods of liquefaction of gases.	Apply
CO4	Interpret the stability regions using Phase diagrams of one component and two component system and compounds with congruent and incongruent melting point.	Evaluate
CO5	Understanding colloids and adsorption for chemical, biological, industrial applications.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	1	3	1	-	-	-	-	-	-	-	-	3	-	-
CO3	3	1	2	1	-	-	-	-	-	-	-	-	3	-	-
CO4	3	-	2	-	-	-	-	-	-	-	-	1	3	-	-
CO5	2	2	3	-	-	-	-	-	-	-	-	1	3	-	-
WT. AVG	2.6	1.5	2.6	1	-	-	-	-	-	-	-	1	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Solid State**	**9**
2.	**Liquid State**	**9**
3.	**Gaseous State**	**9**
4.	**Phase Equilibrium**	**9**
5.	**Colloids and Surface Chemistry**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Solid State**
	● Introduction of the Unit ● Solid state: Definition o fspace lattice, Unit cell. ● Laws of crystallography (i) law of constancy of interfacial angles (ii) law of rationality of indices (iii)law of symmetry. ● Symmetry elements in crystals. X ray diffraction by crystals ● Derivation of Braggs equation ● Determination of crystal structure of NaCl, KCl and CsCl ● Conclusion of the Unit
2.	**Liquid State**
	● Introduction of the Unit ● Liquid State: Surface tension of liquids, capillary action, surface tension and temperature, interfacial tension ● Viscosity of liquids, experimental determination of viscosity coefficient, its variation with temperature. ● Intermolecular forces, structure of liquids (a qualitative description). ● Structural difference between solid, liquid and gases ● Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven-segment cell. ● Conclusion of the Unit
3.	**Gaseous State**
	● Introduction of the Unit ● Gaseous State :Kinetic theory of gases, ideal gas laws ● Behavior of real gases - the Vander Waal's equation ● PV isotherms of real gases, continuity of state, Vander Waals equation and critical state. ● Principle of corresponding states, reduced equation of state. ● Molecular velocities- Root mean square, average and most probable velocities. ● Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. ● Conclusion of the Unit
4	**Phase Equilibrium**
	● Introduction of the Unit ● Phase Equilibrium:Phases, components and degrees of freedom of a system. ● Gibbs Phase Rule and its thermodynamic derivation. ● Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics. ● Bi-Cd system, Pb- Ag system, desilverisation of Pb. ● Solid Solutions-congruent and incongruent melting points ● .Conclusion of the Unit
5	**Colloids and Surface Chemistry**
	● Introduction of the Unit ● Colloidal state and colloidal systems, characteristics of true solutions ● Colloidal solutions and suspensions. ● Classification, preparation and purification of colloidal solutions, ● properties of colloidal solutions: Tyndal effect,Brownian motion. ● Adsorption- Physisorption and chemisorption – Freundlich adsorption isotherm – Langmuir adsorption isotherm. ● Conclusion of the Unit

Sr.No	Reference Book	Author	Edition	Publication
1.	Physical Chemistry	G.M. Barrow	International student edition	McGraw Hill
2.	Physical Chemistry	Barrow, G.M.	latest	Tata McGraw-Hill (2007).

Code: 25BSACSA3104 STATISTICS AND PROBABILITY THEORY 3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Explain the representation to the various forms of data using statistics.	Understand
CO2	Evaluate the statistical data using measures of central tendency and dispersion.	Evaluate
CO3	Analyze the correlation and regression.	Analyze
CO4	Explain the basic concepts of probability and their properties.	Explain
CO5	Determine the probability distribution for discrete and continuous random variable.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	1	3	-	-
CO3	1	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1	3	-	-
CO5	2	3	1	2	-	-	-	-	-	-	-	1	3	-	-
WT. AVG	2	2.8	1.33	2	-	-	-	-	-	-	-	1	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Statistics**	**9**
2	**Central Tendency & Dispersion**	**9**
3	**Correlation and Regression**	**9**
4	**Probability Theory**	**9**
5	**Probability Distribution**	**9**

D. DETAILED SYLLABUS

Unit	Unit details
1	**Statistics**
	● Introduction of the Unit. ● Introduction of Statistics, Scope of Statistics, ● Types of data, Collection, classification and tabulation of data. ● Presentation of data: Frequency polygon, frequency curve, Ogive, Bar diagram, Histogram and Pie chart. ● Conclusion of the Unit
2	**Central Tendency & Dispersion**
	● Introduction of the Unit. ● Measures of Central Tendency: Mean, median, mode, ● Quartile deviation, mean deviation, standard deviation, ● Coefficient of variation. ● Conclusion of the Unit
3	**Correlation and Regression**
	● Introduction of the Unit. ● Correlation, Types of correlation, ● Karl Pearson Coefficient (r) of correlation, Properties, ● Rank correlation coefficient, Regression, ● Lines of Regression, Properties of regression coefficients ● Conclusion of the Unit
4	**Probability Theory**
	● Introduction of the Unit. ● Random Experiment: Trial, Events and their types ● Definition of Probability, Sample Point and Sample space. ● Axiomatic Approach of probability and its properties. ● Addition and multiplication theorems of probability. Conditional probability. Bayes theorem and its applications (Simple problems only) ● Conclusion of the Unit
5	**Probability Distribution**
	● Introduction of the Unit. ● Random variable and its types ● Distribution function, Probability mass function and Probability density function ● Discrete probability distribution: Binomial and Poisson's distribution ● Continuous probability distribution: Normal distribution ● Conclusion of the Unit

Sr.No	Reference Book	Author	Edition	Publication
2.	Introduction to Probability Models	Sheldon Ross	9th Ed	Academic Press, Indian Reprint
3.	Introduction to the Theory of Statistics	Alexander M. Mood, Franklin A. Graybill and Duane C. Boes	3rd Ed	Tata McGraw- Hill, Reprint 2007.
1.	Elements of Statistics, Schaum's outline series,	Bernstein, S. & Bernstein, R	**2001**	McGraw-Hill.

Code: 25BSAESA3101	THERMODYNAMICS AND STATISTICAL PHYSICS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Understanding the principles of thermodynamics, Carnot's engine and cycle, the second law and entropy, providing a comprehensive understanding of thermal interactions in physical systems.	Understand
CO2	Understand advanced topics in thermodynamics, with a comprehensive understanding of the interrelationships and applications of thermodynamic principles.	Understand
CO3	Providing an overview of the production of low temperatures and its significance in various applications, from scientific research to industrial processes.	Understand
CO4	Summarization of key concepts covered in the unit, emphasizing the importance of the distribution law of molecular velocities in understanding gas dynamics and transport phenomena, and its applications in various fields such as chemistry, physics, and engineering.	Apply
CO5	Providing an overview of classical and quantum statistics and their significance in describing the behavior of systems with large numbers of particles.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	3	2	1.2	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Thermal Interaction**	**9**
2.	**Thermodynamic Relation**	**9**
3.	**Production of low temperatures and applications**	**9**
4.	**Distribution Law of Molecular Velocities**	**9**
5.	**Classical and Quantum Statistics**	**9**

D. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Thermal Interaction**
	● Introduction of the Unit ● Zeroth law of thermodynamics ● Various indicator diagrams (P-V diagram) ● First law of thermodynamics, ● Reversible and irreversible processes ● Carnot's engine, ● Carnot's cycle and efficiency of Carnot's engine, ● Reversibility of Carnot's engine, Carnot's theorem. ● Second law of thermodynamics (different statements and their equivalence) ● Entropy, Principle of increase of entropy, Thermodynamic scale of temperature, ● Thermodynamic scale an absolute scale, ● Third law of thermodynamics ● Conclusion of the Unit
2.	**Thermodynamic Relation**
	● Introduction of the Unit ● Maxwell's thermodynamic relations ● Triple point ● Clausius Clapyron latent heat equation (Derivation) ● Effect of pressure on boiling point of liquids ● Helmholtz free energy ● Enthalpy and Gibbs function, Internal energy ● Thermodynamic potentials ● Deduction of Maxwell's relations from thermodynamic potentials. ● Conclusion of the Unit
3.	**Production of low temperatures and applications**
	● Introduction of the Unit ● Joule Thomson expansion and JT coefficient for ideal as well as Vander Waals gas ● Porous plug experiment ● Temperature of inversion ● Regenerative cooling ● Cooling by adiabatic expansion and demagnetization ● Nernst heat theorem. (Derivation) ● Conclusion of the Unit
4.	**Distribution Law of Molecular Velocities**
	● Introduction of the Unit ● Distribution law of molecular velocities, ● Most probable, Average and RMS velocities,

	• Energy distribution function (Derivation) • Experimental verification of Maxwell velocity distribution • Principle of equipartition of energy. • Mean free path and collision cross section • Distribution of mean free path (Derivation) • Transport of mass, • Conclusion of the Unit
5.	**Classical and Quantum Statistics**
	• Introduction of the Unit • Phase space • Micro and macro states • Thermodynamic probability • Relation between entropy and thermodynamic probability • Monatomic ideal gas • Specific heat capacity of diatomic gas and specific heat of solids • Postulates of quantum statistics, • Bose Einstein statistics and its distribution function (Derivation) • Planck's distribution function and radiation formula (Derivation) • Fermi Dirac statistics and its distribution function. (Derivation) • Conclusion of the Unit

E. **RECOMMENDED STUDY MATERIAL:**

Sr.No	Reference Book	Author	Edition	Publication
1.	Heat and Thermodynamics	Singhal, Agarwal and Prakash	Latest	PragatiPrakashan.
2.	Heat and Thermodynamics	Brijlal and Subramaniam	Latest	S. Chand & Sons.
3.	Thermodynamics and Statistical Mechanics	S.L.Kakani	Latest	S. Chand & Sons
4.	Kinetic Theory, Thermodynamics & Statistical Physics	H.P. Sinha	Latest	Ram Prasad & Sons, Agra,

Code: 25BSAESA3102	MATHEMATICAL MODELLING	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Describe the basic concepts of Mathematical modelling and its terminologies	Understand
CO2	Employ mathematical modeling processes of ordinary differential equations	Apply
CO3	Apply and testing numerical simulation for ODE and its application	Apply
CO4	Apply the concepts of Mathematical modelling in partial differential equations	Apply
CO5	Describe the importance of nonlinear dynamics and its application	Understand

B. MAPPING MATRIX OF CO,PO, & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	1	3	1	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	1	2	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
CO5	1	2	3	2	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2	2.4	1.4	1.7	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THECOURSE:

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Introduction to Mathematical modelling**	**9**
2	**Modelling through ODE-I**	**9**
3	**Modelling through ODE-II**	**9**
4	**Modelling through PDE**	**9**
5	**Nonlinear Dynamics**	**9**

D. DETAILEDSYLLABUS:

Unit	Unit Details
1	**Introduction to Mathematical modelling**
	• Introduction of Unit • Mathematical modelling: Need, techniques, classification, • characteristics of mathematical models, • Limitations of mathematical modelling. • Conclusion of the Unit
2.	**Modelling through ODE-I**
	• Introduction of Unit • Mathematical modelling through ordinary differential equations of first order • System of ordinary differential equations of first order: Linear growth and decay models, • Non-linear growth and decay models • Conclusion of the Unit
3.	**Modelling through ODE-II**
	• Introduction of Unit • Mathematical modelling through ordinary differential equations of second order: Planetary motion, • Mathematical modelling through difference equations: Basic theory of linear difference equations with constants coefficients, • Conclusion of the Unit
4	**Modelling through PDE**
	• Introduction of Unit • Mathematical modelling through partial differential equations: • Methods to obtain PDE models • Numerical simulation of PDE models with software • Conclusion of the Unit
5.	**Nonlinear Dynamics**
	• Introduction of Unit • One-dimensional systems and elementary bifurcations. • Two-dimensional systems; phase plane analysis, limit cycles, • Nonlinear Oscillators • Conclusion of the Unit

E. RECOMMENDED STUDYMATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Nonlinear Dynamics and Chaos	Strogatz, Steven H.	9th edition	Westview
2.	Matematical Modelling	J.N. Kapur	Latest	Wiley Eastern Ltd
3.	Mathematical Modelling: Concepts and Case Studies	J. Caldwell and Y.M. Ram,	Latest	Springer
4.	Principles of Mathematical Modelling, Ideas, Methods, Examples	A.A. Samarskii and A.P. Mikhailov	Latest	Taylor and Francis

Code: 25BSAESA3201 CHEMISTRY LAB-III 1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Understand chemical and molecular processes that take place in inorganic chemical reactions in synthesis.	Understand
CO2	Analyze and present experimental results and draw sound conclusions based on experimental evidence.	Analyze
CO3	Demonstrate instrumental techniques for chemical analysis	Apply
CO4	Applying subject knowledge and skill to solve complex problems with defined solutions	Apply
CO5	Understand the different factors that contribute to the adsorption.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	3	1	-	-	-	-	-	-	-	1	3	-	-
CO4	2	3	3	1	-	-	-	-	-	-	-	1	3	-	-
CO5	1	2	3	-	-	-	-	-	-	-	-	1	3	-	-
Wt. AVG	2	2.8	2.8	1	-	-	-	-	-	-	-	1	3	-	-

A. LIST OF EXPERIMENTS

Inorganic Chemistry	
1	Preparation of sodium trioxalatoferrate(III).
2	Estimation of Nickel complex
3	Preparation of copper tetraammine complex.
4	Separation and estimation of Mg(II) and Zn(II)
5	Preparation of Potassium dioxalatodiaquachromate(III).
6	Colorimetric determination of metal ions. Fe^{3+},
Physical Chemistry	
7	To determine the relative strength of two acids(HCl& H2SO4)
8	To verify Beer Lamberts law KMnO4/K2Cr2O7 and determine the concentration of the given solution.
9	To determine the strength of Na and K in a given sample by flame photometer.
10	To titrate potentiometrically the given ferrous ammonium sulphate solution using K2Cr2O7 and calculate the redox potential of Fe^{+2}/Fe^{+3} system
11	To determine the dissociation constant of a weak acid Conductometrically and verify ostwalds dilution law.
12	Adsorption of acetic acid on charcoal

Code: 25BSAESA3202	PHYSICS LAB-III	1 Credits [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Develop a general understanding of different electrical and electronic devices and their characteristics.	Understand
CO2	Develop an understanding and assessment of PN junction diode and transistor characteristics	Analyze
CO3	Understand and apply the phenomenon of bridge rectifier and CRO	Apply
CO4	Apply the principle of Seeback effect and study the variation of Thermo-Emf of a Thermocouple	Apply
CO5	Understand and operate various electrical and thermal components and verification of physical laws.	Understand

B. MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES with PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	3	3	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	3	2	3	-	-
CO3	2	-	-	-	-	-	-	-	-	-	2	-	3	-	-
CO4	3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	3	-	-	-	-	-	-	-	-	-	3	3	-	-
Wt. Avg.	2.7	2.6	2	-	-	-	-	-	-	-	2.6	2.3	3	-	-

C. LIST OF EXPERIMENTS:

1	Identification, testing and application of Resistors, Inductors, Capacitors, PN-Diode, Zener Diode, LED, LCD, BJT, Photo Diode, Photo Transistor, Analog/Digital Multi- Metres and Function/Signal Generator.
2	Study of characteristics of a P-N junction diode.
3	Study of characteristics of a zener diode.
4	Voltage regulation using zener diode
5	Measure the frequency, voltage, current with the help of CRO.
6	Study half wave rectifier and effects of filters on wave. Also calculate ripple factor.
7	Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.
8	To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
9	Study the BJT amplifier in common emitter configuration. Measure voltage gain plot gain frequency response and calculate its bandwidth.
10	Experimental verification of first law of thermodynamics by discharging of condenser.
11	Study of variation of total thermal radiation with temperature.
12	Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss &Vp

Code: 25BEACHM3220	QUANTITATIVE AND VERBAL APTITUDE TRAINING I	Credits: 1 (1-0-2)

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand concepts of number systems, percentages, and interest to solve quantitative problems.	Understand
CO2	Analyze data from tables, pie charts, and bar graphs to derive conclusions and evaluate the sufficiency of information.	Analyze
CO3	Demonstrate accuracy in solving logical reasoning problems involving arrangements, blood relations, and visual patterns.	Apply
CO4	Apply grammatical rules and sentence structures to identify and correct errors in English usage.	Apply
CO5	Develop effective reading, comprehension, and vocabulary skills to enhance verbal aptitude and communication.	Create

B. MAPPING MATRIX OF CO,PO, & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	0	1	1	1	2	2	2	-	1	3
CO2	3	3	3	2	3	0	1	1	1	2	2	2	-	1	3
CO3	2	3	3	3	2	1	1	1	2	2	2	2	-	1	3
CO4	2	2	1	2	2	1	0	2	2	3	1	2	-	1	3
CO5	2	2	1	2	2	2	0	2	2	3	1	3	-	1	3
WT. AVG	2.4	2.6	2	2.2	2.2	1.3	1	1.4	1.6	2.4	1.6	2.2	-	1	3

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Foundations of Quantitative Reasoning	3
2	Applied Arithmetic and Data Analysis	3
3	Logical and Analytical Reasoning	3
4	Verbal Mastery and Grammar Essentials	3
5.	Reading, Vocabulary & Data Interpretation	3

LIST OF LABS	
1.	**Foundations of Quantitative Reasoning**
2.	Number System – I Number system, Power cycle
3.	Number System – II Remainder cycle, Factors, Multiples, HCF & LCM
4.	Reading Comprehension Speed Reading Strategies, RC types, Tackling Strategies
5.	**Applied Arithmetic and Data Analysis**
6.	Data Arrangement – I Linear and Circular Arrangements
7.	Data Arrangement – II Multi-dimensional Arrangement, Blood Relations
8.	Time and Work – I Work with efficiencies, Pipes and Cisterns
9.	**Logical and Analytical Reasoning**
7.	Time and Work – II Work equivalence, Division of wages
8.	Sentence Correction – I Subject-Verb Agreement, Modifiers, Parallelism
	Verbal Mastery and Grammar Essentials
9.	Sentence Correction – IIPronoun Agreement, Verb Tenses, Comparisons
10.	Sentence Correction – III Prepositions, Determiners
	Reading, Vocabulary & Data Interpretation
11.	Reasoning – I Coding-Decoding, Series
12.	Reasoning – II Analogy, Odd Man Out, Visual Reasoning
13.	Percentage & Interest – I Percentages, Percentage Change, S.I.
14.	Percentage & Interest – II C.I., Relation between S.I. and C.I.
15	Verbal & DI Sentence Completion, Para-jumbles, Vocabulary, DI & DS

Code:25BULCSE3201	SKILL ENHANCEMENT COURSES-III	1.0 Credit [LTP: 0-0-2]

Course: MATLAB

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand and navigate the MATLAB user interface.	Understand
CO2	Perform basic arithmetic and variable operations in MATLAB.	Understand
CO3	Create and manipulate vectors and matrices.	Analyze
CO4	Write and execute simple scripts using built-in functions.	Understand
CO5	Plot and interpret basic 2D graphs to visualize data.	Apply

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	1	1	2	1	2	1	-	-
CO2	2	3	3	2	2	-	-	1	1	2	2	3	1	-	-
CO3	3	3	3	2	2	-	-	1	1	2	2	3	1	-	-
CO4	3	3	3	3	3	-	-	1	2	3	2	3	1	-	-
CO5	2	3	2	2	3	-	1	1	1	3	1	2	1	-	-
Wt. AVG	2.6	2.8	2.6	2.0	2.4	-	1	1	1.2	2.4	1.6	2.6	1	-	-

Sr. No.	LIST OF ACTIVITES
1	Introduction to MATLAB Interface (Command Window, Editor, Workspace)
2	Basic Arithmetic Operations (+, -, *, /, ^ in MATLAB)
3	Working with Variables (Creating, assigning, naming variables)
4	Introduction to Arrays and Vectors (Row and column vectors)
5	Introduction to Matrices (Matrix creation and display)
6	Basic Matrix Operations (Addition, subtraction, transpose)
7	Writing and Running Simple Scripts (Save and run .m files)
8	Using Built-in Functions (sqrt, sum, mean, max, min)
9	Simple 2D Plotting (plot(), labels, title)
10	Simple 3D Plotting (plot(), labels, title)

Code: 25BUVCVA3104 **BHARATVARSHA: A LAND OF RARE NATURAL ENDOWMENTS** **2.0 Credits [LTP: 2-0-0]**

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand the unique geographical and strategic features of Bharatavarsha and their impact on its historical development	Understand
CO2	Remember the major river systems of India and understand their importance in the country's cultural and economic life.	Remember
CO3	Remember the key natural resources and climatic features of India that contributed to its sustainability.	Remember
CO4	Understand the demographic strengths and historical economic prosperity of India in relation to the global context.	Understand
CO5	Understand how India's geography supported the rise of a self-sustaining culture and contributed to its civilizational ethos.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-
WT. AVG	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-

A. OUTLINE OF THECOURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Geographical Grandeur of Bharatavarsha	**6**
2.	The Fertile Plains and River Systems	**6**
3.	Climatic Bounty and Natural Wealth	**6**
4.	Demographic and Civilizational Significance	**6**
5.	Cultural Uniqueness Rooted in Geography	**6**

C.DETAILED SYLLABUS

SN	Unit Details
1.	**Geographical Grandeur of Bharatavarsha**
	● Introduction of the Unit ● India as one of the largest cultivable regions in the world ● The natural protection by the Himalayas ● Unique geographical positioning and isolation ● Conclusion of the unit
2.	**The Fertile Plains and River Systems**
	● Introduction of the Unit ● The Sindhu-Ganga river system ● The coastal plains and their agricultural productivity ● Major rivers: Ganga, Yamuna, Brahmaputra, Godavari, Narmada, Krishna, Kaveri, etc. ● River-based civilizations and cultural significance ● Conclusion of the unit
3.	**Climatic Bounty and Natural Wealth**
	● Introduction of the Unit ● Abundant rainfall, sunshine, vegetation, and biodiversity ● Flora and fauna richness ● Mineral resources and their traditional uses ● India's agricultural diversity due to its climate ● Conclusion of the unit
4.	**Demographic and Civilizational Significance**
	● Introduction of the Unit ● India as the most populous land historically and in modern times ● Prosperity and richness that fascinated global civilizations ● India’s contribution to world trade through textiles, spices, and metals ● Conclusion of the unit
5.	**Cultural Uniqueness Rooted in Geography**
	● Introduction of the Unit ● Geographical isolation and cultural continuity ● Harmony between nature and civilization ● Development of a self-contained, rich, and spiritual culture ● Preservation of traditions due to natural boundaries ● Conclusion of the unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No.	Reference Book	Author	Edition	Publication
1	A selection of India Folktales	A.K Ramanujan	2009	Penguin India
2	Folktales of India: A selection of oral tales from 22 languages	Brenda Beck, A.K Ramanujan	1999	University of Chicago Press

Code: 25BSACSA4101	ELECTRONICS DEVICES AND CIRCUITS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Effectively apply Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) to analyze complex electrical circuits.	Analyze
CO2	Analyze and explain the operation of semiconductor diodes, including forward and reverse biasing, current-voltage characteristics, and temperature effects.	Analyze
CO3	Analyze BJT amplifier circuits using various configurations such as common-emitter, common-base, and common-collector.	Analyze
CO4	Understand the operation modes of MOSFETs, including enhancement-mode and depletion-mode operation, and their respective applications.	Understand
CO5	Analyze distortion mechanisms in power amplifiers such as crossover distortion, harmonic distortion, and intermodulation distortion.	Analyze

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	2	1	-
Wt. AVG	2.8	2.6	1.4	-	-	-	-	-	-	-	-	-	2.8	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Circuit Analysis**	**9**
2.	**Semiconductor and Rectification**	**9**
3.	**Bipolar Junction Transistor (BJT)**	**9**
4.	**Field Effect Transistors (JFET and MOSFETs)**	**9**
5.	**Power Amplifiers**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Circuit Analysis**
	• Introduction of the Unit • Important definitions of circuits • Voltage Sources • Voltage and Current divider rules • Kirchhoff's Laws • Four Terminal Network • Reduction of complicated network • Network Theorems • Conclusion of the Unit
2.	**Semiconductor and Rectification**
	• Introduction of the Unit • Classification of Semiconductors: Intrinsic and Extrinsic • Mass Action Law • Fermi level in an Extrinsic Semiconductor and effect of temperature on Fermi Level • P-N Junction Diode • Characteristic of P-N junction diode • Rectification • Ripple factor and efficiency • Filters: Series Inductor, Shunt capacitor, L and π section • Zener diode and Voltage Regulation • Conclusion of the Unit
3.	**Bipolar Junction Transistor (BJT)**
	• Introduction of the Unit • PNP and NPN transistors • Transistor - CB, CE and CC configurations: Input and Output characteristics • Current gains and their relationship. • Relationship between α and β • Transistor as an amplifier • Transistor load line • Transistor as a diode • Transistor Biasing • Selection of Operating Point • Bias Stabilization • Conclusion of the Unit
4.	**Field Effect Transistors (JFET and MOSFETs)**
	• Introduction of the Unit • Junction Field Effect Transistors (JFET)

	• Characteristics of JFETs • FET Configurations • DC load line and bias point • FET biasing • FET small signal models • MOSFET: Construction and working, I-V characteristics • Enhancement and depletion modes • Comparison of JFETs and MOSFETs • Conclusion of the Unit
5.	**Power Amplifiers**
	• Introduction of the Unit • Need of power amplifiers • Classification of power amplifiers, Class A, Class B and Class C power amplifiers • Efficiencies • Harmonic distortion in power amplifier • Variation of output power in Transformer coupled power amplifier • Introduction of Push-Pull Amplifier • Introduction of Tuned amplifiers • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Principles of Electronics	V.K. Mehta and R. Mehta	2010	S. Chand and Company
2.	Electronic Devices and Circuits: An Introduction	Allen Mottershead	2005	Prentice-Hall of India
3.	A Textbook of Applied Electronics	R. S. Sedha	1990	S.Chand and Company Ltd.

Code: 25BSACSA4102	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Describe the nomenclature, structure, bonding and characteristic reactions of Phenols and Ethers	Understand
CO2	Analyze chemical behavior of aldehyde and ketones and discuss name reactions of synthesis.	Analyze
CO3	Describe physical and chemical properties of Carboxylic acids.	Understand
CO4	Compare physical and chemical properties of carboxylic acid derivatives.	Analyze
CO5	Discuss chemical behavior and nucleophilic substitution reactions of amines and diazonium salts.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-	3	-	-
CO4	2	3	1	2	-	-	-	-	-	-	-	-	3	-	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2.6	2.6	1.2	1.4	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Phenols and Ethers**	**9**
2.	**Aldehydes and Ketones**	**9**
3.	**Carboxylic Acids**	**9**
4.	**Carboxylic Acid Derivatives**	**9**
5.	**Amines and Nitro compounds**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Phenols and Ethers**
	• Introduction of the Unit. • Phenols: (Phenol case) Nomenclature, Structure and Bonding, Preparation: Cumenehydroperoxide method, from diazonium salts. • Physical Properties and acidic character. Comparative acidic Strengths of Alcohols and Phenols.resonance stabilization of phenoxide ion. • Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Gattermann-Koch Reaction, Schotten – Baumann Reaction, Fries Rearrangement,Claisen Rearrangement, Ethers (aliphatic and aromatic): Cleavage of ethers with HI. • Nomenclature of Ethers, Method of Formation, Chemical Reactions – Cleavage and autooxidation, Ziesel's Method. • Synthesis of epoxide, Acid and base-catalyzed ring opening of Epoxide , • Conclusion of the Unit
2	**Aldehydes and Ketones**
•	• Introduction of the Unit. • Nomenclature and Structure of Carbonyl Group. • Aldehydes and ketones (aliphatic and aromatic) • Preparation: from acid chlorides and from nitriles. • Reactions – Reaction with HCN, ROH, NaHSO3, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner
•	• reduction. Meerwein-PondorffVerley reduction, Perkin and KnoevenAgel Condensation, Mannich Reaction.. • Conclusion of the Unit
3	**Carboxylic acids**
	• Introduction of the Unit. • Carboxylic acids (aliphatic and aromatic), Nomenclature. • Carboxylic Acids Structure and bonding, physical properties. acidity of carboxylic acids, effects of substituents on acid strength., mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxy acids - malic, tartaric and citric acids. • Reactions: Hell – Vohlard–Zelinsky, reaction, Synthesis of acid chlorides, esters, amides, • Preparation: Acidic and Alkaline hydrolysis of esters. • Dicarboxylic acid- Method Formation and effect of heat and dehydrating agents, succinic, glutaric acid and adipic acid. • Conclusion of the Unit
4	**Carboxylic acid**
	• Introduction of the Unit. • Carboxylic acid derivatives (aliphatic): (Upto 5 carbons) • Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion. • Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation. • Carboxylic Acid Derivatives : Nomenclature Relative stability of acyl derivatives.. Preparation of carboxylic acid derivatives. chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic • Conclusion of the Unit
5	**Amines and Nitro compounds**

	• Introduction of the Unit. • Preparation of nitroalkanes and nitroarencs. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarcncs and their reductions in acidic, neutral and alkaline media. Picric acid.seperation of $1^{0,}$ 2^{0} ,3^{0}. • **Amines:** Amines (Aliphatic and Aromatic): (Upto 5 carbons) • *Preparation*: from alkyl halides, Gabriel's Phthalimide synthesis, HofmannBromamide reaction. • *Reactions:* Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO2, Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation • *Reactions:* conversion to benzene, phenol, dyes • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Organic Chemistry	Morrison and Boyd	Latest	Prentice Hall
2.	Organic Reaction and Their Mechanisms	P. S. Kalsi	Latest	New Age Science
3.	Organic Chemistry	P. L. Soni	Latest	S. Chand & Sons

Code: 25BSACSA4104	ABSTRACT ALGEBRA	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Demonstrate insight into algebraic structure with their axiomatic.	Understand
CO2	Identify subgroups of a given group and their properties.	Understand
CO3	Explain the fundamental concepts of normal subgroups, homomorphism's and isomorphism.	Understand
CO4	Demonstrate knowledge of rings and their properties.	Understand
CO5	Demonstrate knowledge of fields and their properties.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Group**	**9**
2	**Subgroup**	**9**
3	**Group Morphism**	**9**
4	**Rings and Sub-rings**	**9**
5	**Fields**	**9**

D. DETAILED SYLLABUS

Unit	Unit details
1	**Group**
	● Introduction of the Unit. ● Binary operation, Algebraic Structure, Groups, ● Abelian Group, Cyclic Group, order of element, ● Generator of Cyclic Group, Cyclic permutation ● Conclusion of the Unit
2	**Subgroup**
	● Introduction of the Unit. ● Subgroup, center of a group, ● Group Zn of integers under addition modulo n and the ● Group U(n) of units under multiplication modulo n, ● Conclusion of the Unit
3	**Group Morphism**
	● Introduction of the Unit. ● Morphism of groups, Cayley's theorem ● Normal subgroups and Quotient groups ● Fundamental theorem of Isomorphism. ● Conclusion of the Unit
4	**Rings and Sub-rings**
	● Introduction of the Unit. ● Definition and simple properties of rings ● Commutative and non-commutative rings ● Sub-rings, Morphism of Rings ● Embedding of a Ring ● Conclusion of the Unit
5	**Fields**
	● Introduction of the Unit. ● Integral domains and Fields ● Characteristics of a Ring and Field ● Prime fields ● Definition of Vector Spaces, liner combination, liner dependence and liner independent of vectors ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Elements of Abstract Algebra	B. K. C. Sarangi	**2016**	RBD, Jaipur
2.	Abstract Algebra	M. Artin	2nd Ed	Pearson, 2011
3.	A First Course in Abstract Algebra	John B. Fraleigh	7th Ed	Pearson,India 2002

Code: 25BSACSA4105	OPTIMIZATION TECHNIQUES	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Discuss the concept of linear programming problems with solutions of graphical method	Understand
CO2	Testing solution of LPP by simplex, two phase method and primal-dual relationship	Evaluate
CO3	Measuring on transportation problem and its types.	Evaluate
CO4	Estimate the Assignment Problem, Crew assignment and traveling salesman problem.	Understand
CO5	Determining solution of the problems of game theory and saddle points	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	2	1	-	-	-	-	-	-	-	-	3	-	-
CO2	-	1	2	1	-	-	-	-	-	-	--	-	3	-	-
CO3	-	2	2	1	-		-	-	-	-	-	-	3	-	-
CO4	-	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	3	-	-	-	-	-	-	-	--	-	3	-	-
WT. AVG	3	2	2.2	1.2	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Linear Programming**	**9**
2	**Simplex Method**	**9**
3	**Transportation Problem**	**9**
4	**Assignment Problem**	**9**
5	**Game Theory**	**9**

D. DETAILED SYLLABUS

Unit	Unit details
1	**Linear Programming**
	• Introduction to Unit • Concept of optimization, • Linear Programming: Introduction, Formulation of a Linear Programming Problem (LPP), • Requirements for an LPP, Advantages and limitations of LP. • Graphical solution, Multiple, unbounded and infeasible solutions. • Conclusion of the Unit
2	**Simplex Method**
	• Introduction to Unit • Principle of simplex method: standard form, basic solution, basic feasible solution. • Computational Aspect of Simplex Method: Cases of unique feasible solution, no feasible solution, • Multiple solution and unbounded solution and degeneracy • Two Phase method, Duality in LPP, primal-dual relationship • Conclusion of the Unit
3	**Transportation Problem**
	• Introduction to Unit • Transportation Problem: Methods for finding basic feasible solution of a transportation problem • Modified distribution method for finding the optimum solution • Unbalanced and degenerate transportation problems
4	**Assignment Problem**
	• Introduction to Unit • Assignment Problem: Solution by Hungarian method, • Unbalanced assignment problem, maximization in an assignment problem, • Travelling salesman problem. • Conclusion of the Unit
5	**Game Theory**
	• Introduction to Unit • Game Theory: Two Person zero sum game • Game with saddle points, the rule of dominance • Algebraic, graphical and linear programming methods for solving mixed strategy games • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Operations Research –An Introduction	H.A. Taha	**3rd ed**	Pearson, India
2.	Operations Research	KantiSwarup, P.K. Gupta and Manmohan.	2nd Ed	S. Chand publication Delhi
3.	Operations Research	P.K. Gupta and D.S. Hira	2016	S. Chand & Co. Delhi

Code: 25BSAESA4101	ANALOG AND DIGITAL ELECTRONICS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Explain the basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) and their truth tables.	Understand
CO2	Discuss the characteristics and applications of different types of flip-flops and latches such as SR flip-flops, D flip-flops, JK flip-flops, and T flip-flops.	Understand
CO3	Understand the common feedback topologies used in amplifier circuits, including voltage-series feedback, voltage-shunt feedback, current-series feedback, and current-shunt feedback.	Understand
CO4	Familiar with non-sinusoidal oscillator configurations such as relaxation oscillators, multivibrators, and colpits, Hartley oscillators.	Understand
CO5	Describe with different operational amplifier configurations such as inverting amplifiers, non-inverting amplifiers, differential amplifiers, and integrators.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	2	2	1	-	-	-	-	-	-	-	-	3	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.4	2.6	1.4	-	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Number System & Boolean Algebra**	**9**
2.	**Sequential & Combinational Logic Circuits**	**9**
3.	**Feedback Amplifier**	**9**
4.	**Sinusoidal & Non Sinusoidal Oscillators**	**9**
5.	**OPAMP and its Basic Applications**	**9**

D. DETALED SYLLABUS

Unit	Unit Details
1.	**Number System & Boolean Algebra**
	• Introduction of the Unit • Decimal and Binary number system • **Octal** and Hexadecimal number system • Inter conversion • Character codes • ASCII, BCD, Gray code • Logical operations • Boolean algebra • Simplification of boolean expression, • Gates: NOT, AND, OR, NAND, NOR and XOR gates • De-Morgans theorems • Universal gates • Logic circuits for boolean expressions • Conclusion of the Unit
2.	**Sequential & Combinational logic circuits**
	• Introduction of the Unit • Half adder • Full adder • Parallel adder • Half subtractor • Full subtractor • Parallel subtractor, • Flipflops; RS, D, JK • Clocked and edge triggered • PRESET and CLEAR • Counters: Synchronous and Asynchronous counter • Conclusion of the Unit
3.	**Feedback Amplifier**
	• Introduction of the Unit • Feedback concept • Positive and negative feedbacks and their properties • Sampling and mixing • Feedback topology: Voltage series, Voltage shunt, Current series, Current shunt • Effect of positive and negative feedback on gain of amplifier • Frequency response • Gain-stability • Noise, Distortions • Effect of negative feedback on input and output impedances of an amplifier

	• CE amplifier with current series feedback • Conclusion of the Unit
4.	**Sinusoidal & Non sinusoidal Oscillators**
	• Introduction of the Unit • Operation of oscillator • Classification of oscillators • Barkhausen criterion for sustained oscillations • L-C oscillator • R-C Phase shift oscillator • Hartley oscillator • Colpitt's oscillators. • Non Sinusoidal Oscillators: Transistor as a switch • Introduction of multivibrator • Conclusion of the Unit
5.	**OPAMP and its Basic Applications**
	• Introduction of the Unit • OPAMP and its Basic Applications • Differential Amplifier: Common mode and difference mode signals and their gains • CMRR, Emitter- Coupled differential amplifier • Basic Operational Amplifier (Op-Amp) • Ideal operational amplifier • Concept of virtual ground • Inverting and non-inverting OPAMP • Applications of Op-Amp • Inverting Op-Amp as constant multiplier • Sign-Changer • Adder or summing amplifier • Integrator • Differentiator • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Principles of Electronics	V.K. Mehta and R. Mehta	2005	S. Chand and Company
2.	Electronic Devices and Circuits	Allen Mottershead	2002	Prentice-Hall of India
3.	Basic Electronics and Linear Circuits	N.N. Bhargava,D.C. Kulshrestha and S.C. Gupta	1984	Tata McGraw-Hill Publishing Company Ltd., New Delhi

Code: 25BSAESA4102	PARTIAL DIFFERENTIAL EQUATIONS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Discuss the basic concepts of partial differential equation and its terminologies.	Understand
CO2	Employ the methods of partial differential equation	Apply
CO3	Apply methods on second order partial differential equation and its application	Apply
CO4	Apply the concepts of boundary values problems in partial differential equation for solving problems	Apply
CO5	Discuss the Calculus of Variations and its application for solving PDE problems	Understand

B. MAPPING MATRIX OF CO,PO, & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	—	—	—	—	—	—	—	—	-	3	—	—
CO2	3	2	1	—	—	—	—	—	—	—	—	-	3	2	—
CO3	2	3	2	1	—	—	—	—	—	—	—	-	3	—	—
CO4	2	2	2	3	—	—	—	—	—	—	—	-	3	—	—
CO5	2	3	1	—	—	—	—	—	—	—	—	-	3	2	—
WT. AVG	2.2	2.6	1.4	2	-	-	-	-	-	-	-	-	3	2	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**First Order PDE**	**9**
2.	**Methods of first order PDE**	**9**
3.	**Second Order Linear PDE**	**9**
4.	**Boundary Value Problems**	**9**
5.	**Calculus of Variations**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**First Order PDE**
	● Introduction to the Unit ● Introduction to Partial differential equation, ● Classification, Construction and geometrical interpretation of first order partial differential equations (PDE) Introduction, ● Classification, Construction and geometrical interpretation of first order partial differential equations (PDE) ● Conclusion & real life application
2	**Methods of first order PDE**
	● Introduction to the Unit ● Method of characteristic and general solution of first order PDE, ● Canonical form of first order PDE, ● Method of separation of variables for first order PDE. ● Conclusion & real life application
3	**Second Order Linear PDE**
	● Introduction to the Unit ● Classification of second order PDE, ● Reduction to canonical forms, Equations with constant coefficients, ● General solution. ● Conclusion &real life application
4.	**Boundary Value Problems**
	● Introduction to the Unit ● Heat Equation – Fundamental solution, Mean value formula, Properties of solutions, ● Wave Equation – Solution by spherical means, ● Conclusion &real life application
5.	**Calculus of Variations**
	● Introduction To Unit ● Euler's equation for functional containing first-order derivative and one independent variable. ● Extremals. Functional dependent on higher order derivatives. ● Conclusion &real life application

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	A course of Ordinary and Partial differential equation	J. Sinha Roy and S Padhy	Latest	Kalyani Publishers,New Delhi.
2.	Elements of Partial Differential Equations	I.N. Sneddon,	Latest	McGraw Hill, New York
3	A First Course in Partial Differer Equations	H.F. Weinberger	Latest	John Wiley & Sons, 1965

Code: 25BSAESA4103	PHYSICAL CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Apply Raoult's law on colligative properties, abnormal molar mass, degree of dissociation/association	Apply
CO2	Describe the kinetics of zero order, first order, second order and third order reaction by differential and integration	Understand
CO3	Analyze the order of reaction, Arhenius equation, Simple collision theory and Transition state theory.	Analyze
CO4	Explain fundamental thermodynamic concepts and laws, apply them to analyze energy changes in physical and chemical processes	Understand
CO5	Apply thermodynamic principles including the Carnot cycle, entropy, and thermodynamic functions	Apply

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	1	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	3	1	1	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2.6	2.6	1.5	1	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Solutions**	**9**
2.	**Chemical Kinetics I**	**9**
3.	**Chemical Kinetics II**	**9**
4.	**Thermodynamic-I**	**9**
5.	**Thermodynamic-II**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Solution**
	● Introduction of the Unit ● Ideal and non ideal solutions ● Methods of expressing concentrations ● Dilute solutions-colligative properties, Raoults law ● Relative lowering of vapour pressure, Molecular weight determination ● Osmosis, Law of osmotic pressure and its determination, determination of molecular weight from osmotic pressure ● Elevation of boiling point and depression in freezing point ● Conclusion of the Unit
2.	**Chemical Kinetics I**
	● Introduction to the Unit. ● Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction- concentrations, temperature, pressure, solvent, light, catalyst, concentration dependence of rates ● Mathematical characteristics of simple chemical reaction- zero order, first order, second order, pseudo order, half-life and mean life. ● Determinations of the order of reaction- differential method, method of integration, method of half-life period and isolation method ● Radioactive decay as a first order phenomenon ● Conclusion & real life application
3.	**Chemical Kinetics II**
	● Introduction of the Unit ● Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometery. ● Theories of chemical kinetics, Effect of temperature on rate of reaction, ● Arrhenius Equation, concepts of activation energy ● Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis) ● Conclusion of the Unit
4.	**Thermodynamic-I**
	● Introduction of the Unit ● Thermodynamics terms: systems, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamics process. Concept of heat and work. ● First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity. Heat capacities at constant volume and pressure and their relationship. ● Joule law-Joule Thomson co-efficient and inversion temperature. ● Thermochemistry: Standard state, standard enthalpy of formation, Hess's law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. ● Conclusion of the Unit
5.	**Thermodynamic-II**
	● Introduction of the Unit ● Second law of thermodynamics: Carnot cycle and its efficiency. Carnot theorem. Thermodynamic

	scale of temperature. ● Concept of entropy: Entropy as a state function, entropy as a function of Volume and temperature, entropy as a function of pressure and temperature, entropy change in physical change. ● hird law of thermodynamics: Statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function ● T (G) and Helmholtz function (A) asthermodynamic quantities. ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Physical Chemistry	Castellan, G.W.	4th Ed.	Narosa (2004).
2.	Physical Chemistry	Barrow, G.M.	latest	Tata McGraw-Hill (2007).

Code: 25BSAESA4104	ANALYTICAL GEOMETRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom Level
CO1	Define and describe geometric concepts such as planes and their fundamental properties and equations, definitions of direction cosines, direction ratios, and different forms of equations for each geometric shape.	Understand
CO2	Apply the principles and equations of geometry to solve problems involving the calculation of angles between lines and planes, distances of points from planes, and intersections of various geometric forms such as lines with planes and spheres with planes.	Apply
CO3	Solve the general and standard forms of the equation of a sphere, differentiating between them such as the conditions under which a plane is tangent to a sphere or when a circle is precisely the intersection.	Apply
CO4	Explain the fundamental geometric properties and differences between various types of cones and cylinders, including right circular cones, reciprocal cones, and enveloping cylinders. They will also define and discuss the concept of an enveloping cone and tangent planes.	Apply
CO5	Analyze the conditions under which a line will intersect an ellipsoid or hyperbolic and determine the conditions for tangency of lines and planes to these surfaces. They will dissect complex problems involving multiple geometric elements to identify underlying relationships.	Analyze

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	-	2	3	-	-	-	-	-	-	-	-	-	2	-	-
WT. AVG	2.3	2.4	2	-	-	-	-	-	-	-	-	-	2.2	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Plane**	**9**
2	**Straight Line**	**9**
3	**Sphere**	**9**
4	**Cone and Cylinder**	**9**
5	**Central Conicoids**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Plane**
	● Introduction of the Unit ● System of Coordinates, Direction Cosines, Direction Ratios and Projections, ● Angle between two lines, Condition of Perpendicularity and parallelism, ● Equation of plane in various forms, Angle between two planes, Distance of a point froma plane, plane through intersection of two planes ● Planes bisecting the angle between two planes, Equation of Pair of Planee ● Conclusion of the Unit.
2	**Straight Line**
	● Introduction of the Unit ● Equation of Straight line, Symmetrical Form, General Form, ● Perpendicular distance of a point from a line, angle between plane and line, ● General Equation of Plane containing Line, ● Conclusion of the Unit
3	**Sphere**
	● Introduction of the Unit ● Equation of the sphere in general and standard forms ● Equation of a sphere with given ends of a diameter. ● Plane section of a sphere. Sphere through a given circle. ● Intersection of two spheres, Orthogonality of spheres Tangent Plane, ● Conclusion of the Unit
4	**Cone and Cylinder**
	● Introduction of the Unit ● Cone, Enveloping Cone, Tangent plane of a cone, Condition of Tangency, ● Reciprocal cone, condition of three mutually perpendiculars, ● Right Circular Cone, Cylinder, Enveloping cylinder, Right Circular Cylinder. ● Conclusion of the Unit
5	**Central Conicoids**
	● Introduction of the Unit ● Central Conicoids, Standard Equation, ● Ellipsoid, Hyperboloid of one and two sheet, ● Intersection of line with Conicoid, ● Tangent lines and Tangent Planes, ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	A Textbook of Analytical Geometry of Three Dimensions	P.K. Jain and Khalil Ahmad	1999	Wiley Eastern Ltd.
2.	The Elementsof Coordinate Geometry	S.L. Loney:	1999	McMillan and Company, London.
3.	Analytical Solid Geometry	P. K. Mittal, Shanti Narayan,	1992	S. Chand &Co.delhi

Code: 25BSAESA4201	CHEMISTRY LAB-IV	1 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Evaluate the technique of various ions present in a mixture.	Evaluate
CO2	Recognize the basic practical skills for the synthesis and analysis of organic compounds.	Understand
CO3	Demonstrate purification and separation techniques of compounds	Apply
CO4	Analyze and present experimental results and draw sound conclusions based on experimental evidence.	Analyze
CO5	Apply different processes used in industries and their applications	Apply

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO5	1	2	3	1	-	-	-	-	-	-	-	1	3	-	-
Wt. AV G	2	2.8	2.8	1	-	-	-	-	-	-	-	1	3	-	-

C. LIST OF EXPERIMENTS

Inorganic Chemistry	
1	Estimation of sodium carbonate and sodium hydroxide present in a mixture.
2	Estimation of acetic acid in commercial vinegar using NaOH
3	Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.
4	Estimation of Ferrous and Ferric by dichromate method
5	Estimation of Cu as copper thiocyanate
6	Estimation of ascorbic acid from lemon peel
Organic Chemistry	
7	Preparation of Ni- DMG complex
8	To separate and identify the organic mixture containing two solid components using NaOH.
9	To prepare Iodoform from ethanol and acetone
10	Estimation of glucose by Fehling's solution.
11	Isolation of caffeine from tea leaves.
12	Synthesis of methyl orange

Code: 25BSAESA4202	PHYSICS LAB-IV	1 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will able to:	Bloom level
CO1	Understand the operation and perform the various integrated circuits	Understand
CO2	Verify and analyze the truth table of various logic gates and designing a counter using flip-flop.	Analyze
CO3	Analyze and apply the concept of converter from A to D and D to A types of circuits	Apply
CO4	Understand the concept of various multivibrator	Understand
CO5	Understand and analyze the frequency of various oscillators	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	2	2	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	3	2	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	2	3	-	-	-	-	-	-	-	-	2	3	3	-	-
Wt. Avg.	2.5	2.3	-	-	-	-	-	-	-	-	2.5	2.3	3	-	-

C. LIST OF EXPERIMENTS:

1.	To study and perform the following experiments. (a) Operation of digital multiplexer and demultiplexer. (b) Binary to decimal encoder. (c) Characteristics of CMOS integrated circuits.
2.	To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
3.	To study and perform experiment - Digital to analog and analog to digital converters.
4.	To study and perform experiment- Various types of counters and shift registers.
5.	To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
6.	To study and perform experiment- BCD to binary conversion on digital IC trainer.
7.	To study and perform experiment - (a) Astable (b) Monostable (c) BistableMultivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.
8.	To study and perform experiment -Voltage comparator circuit using IC-710.
9.	To study and perform experiment- Schmitt transistor binary circuit.
10.	Design 2 bit binary up/down binary counter on bread board.
11.	Study of operation of Colpitt's Oscillator and Hartley Oscillator
12.	Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.

Code: 25BEACHM4224	QUANTITATIVE AND VERBAL APTITUDE TRAINING II	Credits: 1 (1-0-2)

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand principles of profit and loss, averages, ratios, and equations to solve quantitative problems.	Understand
CO2	Apply concepts of speed, time, distance, probability, and permutations to real-life and theoretical problems.	Apply
CO3	Analyze logical reasoning problems using connectives, syllogisms, and Venn diagrams.	Analyze
CO4	Demonstrate proficiency in grammar, sentence construction, and transformation through speech and voice.	Apply
CO5	Create solutions using image-based interpretation and attention to detail to enhance analytical thinking.	Create

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	-	1	-	2	1	2	-	1	3
CO2	3	3	2	1	2	-	1	1	-	1	1	2	-	1	3
CO3	2	2	3	3	1	-	-	1	1	2	-	2	-	1	3
CO4	1	1	1	2	2	1	-	3	1	3	-	2	-	1	3
CO5	2	3	3	2	2	-	1	1	2	2	1	3	-	1	3
Wt. Avg.	2.2	2.2	2.2	1.8	1.6	1	1	1.4	1.3	2	1	2.2	-	1	3

C. OUTLINE OF THECOURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Quantitative Techniques and Business Maths	3
2	Permutation, Probability and Speed Analysis	3
3	Verbal Logic and Grammar Usage	3
4	Logical Thinking and Data-Based Reasoning	3
5	Visual & Spatial Analysis and Interpretation	3

D. DETAILED SYLLABUS

LIST OF LABS	
	Unit 1: Quantitative Techniques and Business Maths
1.	**Profit, Loss & Partnerships** *Basic terminologies, Partnership, Averages*
2.	**Mixtures and Alligations** *Weighted Average, Mixtures and Alligations*
3.	**Ratio, Proportion and Ages** *Ratio, Proportion, Variation, Simple equations, Ages*
4.	**Unit 2: Permutation, Probability and Speed Analysis**
5.	**Permutations & Combinations – I** *Fundamental Counting, Permutation, Circular Permutations*
6.	**Permutations & Combinations – II** *Computation of Combination, Probability*
7.	**Speed-Time-Distance** *Basics, Relative Speed, Boats, Trains, Races*
8.	**Unit 3: Verbal Logic and Grammar Usage**
7.	**Articles & Prepositions** *Definite/Indefinite Articles, Omission, Compound Prepositions*
8.	**Interrogatives & Sentence Framing** *Prepositional Phrases, Interrogative Structures*
	Speech and Voice Transformation *Active-Passive Voice, Direct-Indirect Speech*
9.	**Unit 4: Logical Thinking and Data-Based Reasoning**
10.	**Logical Connectives & Syllogisms** *Logical Connectives, Syllogistic Analysis*
	VennDiagrams *Interpretation and Problem Solving with Venn Diagrams*
11.	**Clocks, Calendars & Cubes** *Time Reasoning, Direction Sense, Cubes*

12.	**Unit 5: Visual & Spatial Analysis and Interpretation**
13.	**Progressions & Logarithms** *Arithmetic, Geometric Progressions, Logarithms*
14.	**Geometry & Quadratics** *Geometry, Mensuration, Quadratic Equations*
15	**Image Interpretation & Detail Analysis** *Rebus, Forming Words, String Matching, Text/Image Comprehension*

CODE: 25BUACHM4223	PUBLIC SPEAKING	1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Produce effective public speaking skills.	Apply
CO2	Analyze arguments critically from different perspectives.	Analyse
CO3	Show impromptu and on-the-spot speaking skills.	Apply
CO4	Illustrate critical thinking and problem-solving abilities.	Apply
CO5	Practice confidence and overcome public speaking anxiety.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	3	2	0	2	2	3	2	2	-	1	3
CO2	2	2	2	2	3	1	0	2	1	3	1	2	-	1	3
CO3	1	3	2	3	2	1	0	2	2	3	2	2	-	1	3
CO4	2	2	2	3	2	2	1	2	2	2	2	3	-	1	3
CO5	1	2	2	2	2	2	0	2	3	2	3	2	-	1	3
Wt. Avg	1.6	2	1.8	2.4	2.4	1.6	1	2	2	2.6	2	2.2	-	1	3

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Introduction to Public Speaking and Preparing Your Speech**	**3**
2	**Delivery Techniques and Persuasive Speaking**	**4**
3	**Impromptu Speaking and Introduction to Debating**	**3**
4	**Constructing Arguments and Rebuttal and Cross-Examination**	**2**
5	**Debate Practice and Conclusion and Final Presentations**	**3**

C. . DETAILED SYLLABUS

Unit	Title of the Unit
1.	**Introduction to Public Speaking and Preparing Your Speech**
	• Overview of the course and its objectives. • Understanding the importance of public speaking and debate skills. • Introduction to effective communication strategies. • Introduction to the art of persuasion. • Selecting and analyzing a topic. • Conducting research and gathering evidence. • Organizing your speech with a clear introduction, body, and conclusion. • Understanding different speech structures and formats.
2.	**Delivery Techniques and Persuasive Speaking**
	• Enhancing vocal skills (projection, intonation, pace, etc.). • Body language and non-verbal communication. • Using visual aids effectively. • Managing stage fright and nervousness. • Identifying persuasive techniques and rhetorical devices. • Developing logical arguments and appeals. • Understanding the target audience and adapting the speech accordingly. • Practicing persuasive delivery.
3.	**Impromptu Speaking and Introduction to Debating**
	• Strategies for impromptu speaking. • Developing quick thinking and improvisation skills. • Structuring impromptu speeches effectively. • Practice sessions with impromptu topics. • Overview of the debate format and structure. • Understanding the roles of different participants. • Analyzing and evaluating arguments
4.	**Constructing Arguments and Rebuttal and Cross-Examination**

	• Identifying and formulating strong arguments. • Using evidence and examples to support your points. • Developing logical and coherent argumentation. • Counter-arguments and refutation techniques. • Effective rebuttal techniques. • Strategies for countering opponents' arguments. • Cross-examination skills and tactics. • Practice sessions for rebuttal and cross-examination.
5.	**Debate Practice and Conclusion and Final Presentations**
	• Conducting mock debates. • Applying the learned techniques in real debate scenarios. • Receiving constructive feedback and analysis. • Recap of key concepts and techniques. • Final presentations by participants. • Peer evaluation and feedback.

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	The Art of Public Speaking	Stephen E. Lucas	2020	McGraw-Hill Education
2.	Speak with Confidence: A Practical Guide	Dianna Booher	2018	Harper Business
3.	Debate: A Strategy for Successful Academic Writing	Gary Goshgarian and Kathleen Krueger	2012	Longman

Code: 25BULCSE4201	SKILL ENHANCEMENT COURSE -IV	1.0 Credits [LTP: 0-0-2]

Course: DOCUMENT PREPARATION AND PRESENTATION

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand the process of downloading, installing, and accessing LaTeX, LibreOffice, and MS Office software on various platforms.	Understand
CO2	Analyze software-specific features and menu options to effectively create and manipulate documents.	Analyze
CO3	Demonstrate the ability to develop well-structured and visually appealing documents using LaTeX, LibreOffice Writer, or MS Word	Apply
CO4	Apply advanced formatting techniques to enhance the readability and aesthetics of document content	Apply
CO5	Incorporate and analyze the use of tables, figures, algorithms, and equations into documents to effectively communicate complex information.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	2	-	3	-	-	-	-	-	-	-	1	3	-
CO2	-	-	2	3	2	-	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	2	-	-	-	-	-	-	-	-	3	-
CO4	2	-	-	2	2	-	-	-	-	-	-	-	-	2	-
CO5	-	3	2	-	1	-	-	-	-	-	-	-	1	3	-
Avg wt.	2	2	2.2	2.5	2	-	-	-	-	-	-	-	1	2.8	-

Sr. No.	LIST OF ACTIVITES
1	Downloading, Installing and Accessing LaTex / LibreOffice / MS Office
2	Using Software Specific Features and Menu Options
f3	Creating a LaTeX/ LibreOffice/MS Office document
4	Setting Up the Document
5	Formatting the document content
6	Adding Tables and Figures to the document
7	Incorporating Algorithms and Equations in the documents
8	Using the Referencing and Indexing options
9	Using Zotero for referencing
10	Making Presentations in LibreOffice / MS Office

Code: 25BSACSA5101	NUCLEAR PHYSICS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Students will understand the fundamental principles governing the structure of atomic nuclei, including the arrangement of protons, neutrons, and other subatomic particles within the nucleus.	Understand
CO2	Demonstrating different types of nuclear reactions, including fusion, fission, and radioactive decay processes	Understand
CO3	Identification and Classification of elementary particles and to apply the conservation laws.	Apply
CO4	Understand the need for accelerators and their different types.	Understand
CO5	Compare the different types of nuclear radiation detectors and to understand the principle of radiation detection.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	1	3	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.6	1.4	1.4	2	-	-	-	-	-	-	-	-	2.8		-

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Structure of Nuclei**	**9**
2.	**Nuclear Fission and Fusion**	**9**
3.	**Particle Physics**	**9**
4.	**Accelerators**	**9**
5.	**Radiation Detectors**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Structure of Nuclei**
	● Introduction of the Unit ● Basic Properties of Nuclei: (1) Mass, (2) Radii, (3) Charge, (4) Angular Momentum, (5) Spin, (5) Magnetic Moment (μ), (6) Stability ● Rutherford scattering and Rutherford's scattering formula ● Constituents of nucleus ● Magnetic dipole moment of nuclei ● Basic idea about quadruple moment of nucleus ● Nuclear spin and parity ● Orbital angular momentum ● Nuclear mass, Mass Defect and Binding energy ● Theory of Nuclear forces. ● Packing fraction and binding energy of nucleus ● Liquid drop model of nucleus ● Semi-empirical mass formula (Volume, Surface, Coulomb, Asymmetry and Pairing energy terms) ● Conclusion of the Unit
2.	**Nuclear Fission and Fusion**
	● Introduction of the Unit ● The Discovery of Nuclear Fission ● The Energy Release in Fission ● Fission cross Section and threshold, Neutron emission in fission ● The prompt neutron and delayed neutrons ● Mechanism for the emission of delayed neutrons ● Energy of fission Neutrons ● Barrier Penetration-Theory of Spontaneous fission ● Nuclear Energy Sources ● Nuclear Fission as a source of Energy ● The Nuclear Chain Reaction ● Condition of controlled chain Reaction, Nuclear Reactors ● Energy release in fusion ● Fusion reactions in stars: carbon and pp cycle. ● Conclusion of the Unit
3.	**Particle Physics**
	● Introduction of the Unit ● Classification of elementary particles ● Properties of particles. ● Fundamental interactions, ● **Conservation laws** : Energy ,momentum, angular momentum, charge, lepton number, Baryon number, isospin, strangeness, Invariance under charge, parity, C.P., time and C.P.T.,(Qualitative

	discussion). ● **Cosmic rays:** Properties of cosmic rays ,properties of secondary radiation, electronic showers ,geomagnetic effects, cosmic ray stars, the origin of cosmic rays ● Conclusion of the Unit
4.	**Accelerators**
	● Introduction of the Unit ● Need for accelerators ● Ion sources, Van De Graff generator ● Drift tube ● Linear accelerator ● Wave guide accelerator ● Cyclotron ,synchrocyclotron ● Electron synchrotron, Proton synchrotron ● Conclusion of the Unit
5.	**Radiation Detectors**
	● Introduction of various methods used in detection of nuclear radiation ● Principle and working of (i) Ionization chamber (ii) Proportional counter (iii) Geiger- Muller counter; Dead time, Recovery time and paralysis time ● Scintillation counter ● Cloud chamber ● Bubble chamber ● Spark chamber ● Solid state detectors ● Basic components of mass spectroscope ● Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Nuclear Physics	S.N. Ghoshal	2012	S. Chand Publication, Delhi
2.	Nuclear Physics	D.C. Tayal	1982	Himalaya Publishing House
3.	The Atomic Nucleus	R.D. Evans	1955	Mc-Graw Hill

Code: 25BSACSA5102 ATOMIC AND MOLECULAR SPECTROSCOPY 3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes	At the end of this course, learners will be able to:	Bloom Level
CO1	Explain Bohr's theory, quantization of energy levels for hydrogen atom, solve related numerical problem	Understand
CO2	Understand the concept of electron spin and its role in the vector model of the atom, as well as its experimental verification through the Stern-Gerlach experiment.	Understand
CO3	Show the splitting of spectral lines of atom in the presence of electric and magnetic field and study the fine structure of atoms.	Apply
CO4	Explain the difference between Stokes and anti-Stokes lines in a Raman spectrum.	Understand
CO5	Apply Moseley law and compare optical and x-ray spectra for molecules	Apply

B.MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.6	2.4	1.4	-	-	-	-	-	-	-	-	1	2.8	-	-

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Bohr's Theory of Spectra**	**9**
2.	**Vector Model of Atom and Stern-Gerlach Experiment**	**9**
3.	**Effect of Magnetic and Electric Field on Spectral Lines**	**9**
4.	**Molecular Spectra**	**9**
5.	**X-rays**	**9**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Bohr's Theory of Spectra**
	• Introduction to the Unit • Bohr's theory of spectra of hydrogen like atoms • Origin of spectral series • Ritz combination rule • Effect of finite mass of the nucleus on the spectrum • Bohr's correspondence principle • Wilson-Sommerfield's quantum condition • Sommerfield's theory of elliptic orbit (qualitative idea) • Relativistic correction • Frank and Hertz principle • Limitations of Bohr's theory • Conclusion of the Unit
2.	**Vector Model of Atom and Stern-Gerlach Experiment**
	• Introduction to the Unit • Angular momentum of electron • Stern–Gerlach experiment and its consequence • Space quantization • Spin orbit interaction energy • Total angular momentum • Coupling schemes • Fine structure of a spectral line • Selection rules, Spectral term and their notations • Conclusion of the Unit
3.	**Effect of Magnetic and Electric Field on Spectral Lines**
	• Introduction to the Unit • Angular momentum and magnetic moment • Zeeman Effect: Normal Zeeman effect and its selection rules • Anomalous Zeeman effect and its selection rules • Paschen back effect and selection rules • Stark effect: Linear Stark effect • Conclusion of the Unit
4.	**Molecular Spectra**
	• Introduction to the Unit • Rotational Energy levels • Selection Rules and Pure Rotational Spectra of a Molecule • Vibrational Energy Levels • Selection Rules and Vibration Spectra • Rotation- Vibration Energy Levels • Selection Rules and Rotation-Vibration Spectra

	• Determination of Internuclear Distance • Quantum Theory of Raman Effect • Characteristics of Raman Lines. Stoke's and Anti-Stoke's Lines • Complimentary Character of Raman and infrared Spectra • Conclusion of the Unit
5.	**X-rays**
	• Introduction to the Unit • Origin of continuous and characteristic X-Rays • Absorption and emission spectrum • Energy levels and Moseley's law • Fine structure of X-ray levels • Auger effect • Comparison of optical and X-ray spectra • Classification of molecular spectra, • Rotational spectra and Rotational-Vibrational spectra and selection rules • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Atomic physics	J. B. Rajam	2007	S. Chand & Company
2.	Elements of Spectroscopy	S.L. Gupta, V. Kumar and R.C. Sharma	2005	Prentice-Hall of India
3.	Fundamentals of Molecular Spectroscopy	Colin N. Banwell and Elaine M. Mccash	1995	Tata McGraw-Hill, New Delhi,

Code: 25BESCES5103	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Demonstrate structure elucidation of organic compounds using UV, IR and NMR spectroscopy.	Apply
CO2	Demonstrate Nuclear Magnetic Resonance spectroscopy and PMR spectra of organic compounds.	Apply
CO3	Apply mechanism of action of heterocyclic compounds in pharmaceutics/drugs.	Apply
CO4	Describe carbohydrates, their structure and conversion with other carbohydrates	Understand
CO5	Understand the chemical nature of Amino Acids, Peptides and Proteins.	Understand

B. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2.6	2.6	2	1	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Electromagnetic Spectrum**	**9**
2.	**Nuclear Magnetic Resonance (NMR) spectroscopy**	**9**
3.	**Heterocyclic Compounds**	**9**
4.	**Carbohydrates**	**9**
5.	**Amino Acids, Peptides and Proteins**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Electromagnetic Spectrum**
	● Introduction to the Unit ● **Electromagnnetic Radiation** ● Origin of organic spectra, Types of energy changes, Types of molecular spectra, General instrumentation, absorbance and transmittance, line width. ● **Ultraviolet Absorption Spectroscopy**- absorption laws (Beer-Lambert Law) molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, ● Effect of solvents on transitions, effect of conjugation, concept of chromophore and auxochrome, bathochromic, hypsochromic and hyperchromic and hypochromic shifts, ● UV spectra of conjugated enes and enones. ● **Infrared Absorption Spectroscopy** – Theory-Absorption of infra radiation Molecular vibrations, Hookes law, selection rules, intensity and position of IR bands measurement of IR spectrum, finger print region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. ● Conclusion & real life application.
2	**Nuclear Magnetic Resonance (NMR) spectroscopy**
	● Introduction to the Unit. ● **Nuclear Magnetic Resonance (NMR) spectroscopy**: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra different scales, ● Proton magnetic resonance (^{1}H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals. Interpretation of NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, I,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. ● Conclusion & real life application
3	**Heterocyclic Compounds**
	● Introduction to the Unit. ● Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole ● Aromatic character ● Preparation from 1, 4, - dicarbonyl compounds, ● PaulKnorr synthesis. Properties: Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. ● Pyridine – Structure - Basicity – Aromaticity ● Conclusion & real life application.
4	**Carbohydrates**

	● Introduction to the Unit ● **Carbohydrates**: Classification, and General Properties ● Glucose and Fructose (open chain and cyclic structure) ● Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation ● Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation ● Mechanism of osazone formation. Epimers, anomers. Interconversion of glucose and fructose, chain lengthening and chain, shortening of aldoses. Conversion of glucose into mannose.. Determination of ring size of monosaccharides. ● Conclusion & real life application.
5	**Amino Acids, Peptides and Proteins**
	● Introduction to the Unit ● Amino Acids, Peptides, Proteins and its classification, structure and stereochemistry of amino acids. acid-basebehaviour, isoelectric point and electrophoresis. Preparation and reactions of alpha-amino acids. ● Amino Acids Preparation by Strecker synthesis using Gabriel's phthalimide synthesis. ● Reactions of Amino acids: ester of –COOH group, acetylation of –NH2 group, complexation with Cu^{2+} ions, ninhydrin test ● Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. ● Determination of Primary structure of Peptides by degradation- Edmann degradation (N terminal and C terminal) thiohydantoin and with carboxy peptidase enzyme ● Conclusion & real life application.

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	A Text Book of Organic Chemistry	O. P. Agarwal	Vol. I & II	Goyal Publication
2.	A Text Book of Organic Chemistry	B. S. Bahl and ArunBahl	Latest	S. Chand & Company Ltd.
3.	Organic Chemistry	S. M. Mukherji, S. P. Singh and R. P. Kapoor	Vol. I, II & III	Wiley Eastern Ltd. (New Age International)
4	Organic Chemistry	I.L. Finar	Vol.-I & II	Pearson Education, Asia

Code: 25BSACSA5104	REAL ANALYSIS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO)	At the end of this course, learners will be able to:	Bloom Level
CO1	Define sets, Axioms, Real number, complete ordered field, Interval, Neighborhood of a point.	Remember
CO2	Explain the Boundedness, supremum, Infimum of sequence, various types of sequence, limits, Cauchy's theorem.	Understand
CO3	Discuss the limits & Continuity of functions, Heine's definition of continuity, Types of Discontinuity, Boundedness theorem, Intermediate Value theorem.	Understand
CO4	Explain the derivative, Darboux's Theorem, Rolles's Theorem, Lagranges mean value theorem, Cauchy mean value theorem, Taylor's Theorem, Maclaurin's theorem.	Apply
CO5	Compute the upper and Lower Darboux sums, Riemann Integral, Properties of R- Integrable function, Mean value theorem of Integral Calculus, Fundamental theorem of Integral Calculus.	Apply

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	3	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	3	-	-
CO4	2	3	1	1	-	-	-	-	-	-	-	1	3	-	-
CO5	2	3	1	1	-	-	-	-	-	-	-	1	3	-	-
WT. AVG	2.6	2.4	1	1	-	-	-	-	-	-	-	1	3	-	-

B. OUTLINE OF THE COURSE

Unit No.	**Title of the Unit**	**Time required for the Unit (Hours)**
1	**Real Field**	9
2	**Real Sequences**	9
3	**Limit and Continuity of Function**	9
4	**Mean value theorem**	9
5	**Riemann Integration**	9

C. DETAILED SYLLABUS

Unit	Unit details
1	**Real Field**
	● Introduction to the Unit ● Introduction-ordered sets, The Field Axioms, Order axioms ● Completeness axioms, Real number as a complete ordered field ● Interval, neighborhood of a point ● Heine Borel Theorem ● Conclusion of the Unit
2	**Real Sequences**
	● Introduction to the Unit ● Boundedness, supremum, Infimum of sequence, Limit of sequence, Convergent sequences ● Divergent sequence, Theorems on convergent sequence and limits ● Cauchy's first theorem on limits, Subsequences, Cauchy sequence, Cauchy's general principle ● Cauchy Convergence test, Ratio Comparison test, Hyperharmonic series test, Raabe's Test, Logarithmic ratio test, De Morgan's test ● Conclusion of the Unit
3	**Limit and Continuity of Function**
	● Introduction to the Unit ● Limits of functions, Continuity ● Heine's definition of continuity, Discontinuity ● Types of Discontinuity ● Intermediate Value theorem, Uniform continuity ● Conclusion of the Unit
4	**Mean value theorem**
	● Introduction to the Unit ● Derivative, necessary condition, Properties of derivatives ● Darboux's Theorem, Rolles's Theorem ● Lagranges mean value theorem, Cauchy mean value theorem ● Taylor's Theorem, Maclaurin's theorem ● Conclusion of the Unit
5	**Riemann Integration**
	● Introduction to the Unit ● Upper and Lower Darboux sums, Upper and Lower Riemann Integral ● Necessary and sufficiency condition of R- Integrability, Properties of R- Integrable function ● Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Principles of Mathematical Analysis	Walter Rudin	**3rd ed**	McGraw–Hill International Editions, Singapore
2.	Mathematical Analysis	Tom M. Apostol	2nd Ed	Pearson, India
3.	Real Analysis	K. C. Sarangi	2016	RBD Jaipur

Code: 25BESEES5101	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Demonstrate different Acid Base theories and Solvent system concept.	Apply
CO2	Analyze metal ligand bonding in transition metal complexes with the help of Valence Bond Theory and Crystal field Theory.	Analyze
CO3	Understand the magnetic &spectral properties, thermodynamic and kinetic aspects of metal complexes.	Understand
CO4	Describe synthesis, properties and applications of organometallic compounds.	Understand
CO5	Evaluate redox potential, redox cycle and disproportionation using Frost, Latemar and Roubaixdiagram.	Evaluate

A. MAPPING MATRIX OF CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
WT. AVG	2.6	2.6	1	1	-	-	-	-	-	-	-	-	3	-	-

B. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Acids & Bases and Non-aqueous Solvents	9
2.	Metal Ligand bonding in transition metal complexes	9
3.	Magnetic and Spectral properties of Transition Metal Complexes	9
4.	Organometallic Chemistry	9
5.	Oxidation & Reduction	9

C. DETAILED SYLLABUS

Unit	Unit Details
1.	**Acids & Bases and Non-aqueous Solvents**
	• Introduction of the Unit • **Acids and bases:** Theories ofArrhenius, Bronsted-Lowry, Lux-Flood • Solvent system concept and Lewis concept of acids and bases • Hard and Soft Acids and Bases (HSAB): Classification of acids and bases as hard and soft. • Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness • **Non-aqueous solvents :**Physical properties of solvent, types of solvent and their general characteristics • reactions in non-aqueous solventswith reference to liq. NH_3 and liq. SO_2, HF • Conclusion of the Unit
2.	**Metal Ligand bonding in transition metal complexes**
	• Introduction of the Unit • **Transition Metals:** Characteristic properties transition elements – ionic radii, oxidation states, complexation tendency, magnetic behavior and electronic spectral properties. • Metal ligands bonding in transition metal complexes • Limatation of VBT, Elementary idea of CFT, Crystal field splitting in Octahederal ,Tetrahederal and Square planer complexes ,Factors affecting the crystal field parameter • Conclusion of the Unit
3.	**Magnetic and Spectral properties of Transition Metal Complexes**
	• Introduction of the Unit • Magnetic Properties of Transition Metal Complexes:Types of magnetic behavior, methods of determining magnetic susceptibility, L-S and J-J coupling, orbital contribution to magnetic moments. Correlation of magnetic moment data and stereochemistry of Co (II) and Ni (II) complexes; anomalous magnetic moments • Spectral properties of transition metal complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states and Spectoscopic terms (L-S Coupling) , spectrochemical series, orgelenergy level diagram for d1 and d9 states, the electronic spectrum of [Ti(H2O)6]+3 complex ion. • Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes • Conclusion of the Unit
4.	**Organometallic Chemistry**
	• Introduction of the Unit • **Organometallic chemistry:** Definition, nomenclature and classification of organometallic compounds, • Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metal – ethylenic complexes and homogenous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls. • Conclusion of the Unit
5.	**Oxidation & Reduction**

	• Introduction of the Unit • Use of Redox potential data • Analysis of redox cycle • Redox stability in water • Disproportnation • Diagrammatical presentation of potential data-Frost, Latimar and pourbaix diagram • Principle involved in the extraction of elements • Conclusion of the Unit

D. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Selected Topics in Inorganic Chemistry	Malik Tuli,Madan	Latest	S. Chand & Sons
2.	Advanced Inorganic Chemistry	S. K Agarwal, Keemtil	Latest	PragatiPrakashan

Code: 25BSAESA5102 ANALOG AND DIGITAL CIRCUITS 3.0 Credits [LTP: 3-0-0]

A. **COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING**

Course Outcomes (COs)	**At the end of this course, learners will able to:**	**Bloom level**
CO1	Explain the theory of PN Junctions and FET.	Understand
CO2	Analyze operational amplifiers for inverting and non-inverting case	Analyze
CO3	Understand the number system and its application for conversions	Understand
CO4	Describe construction and working of oscillators	Apply
CO5	Analyze combinational logic circuits	Analyze

A. MAPPING MATRIX OF CO, PO & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.6	2.6	1.5	2	-	-	-	-	-	-	-	-	3	-	-

B. **OUTLINE OF THECOURSE**

Unit No.	**Title of the Unit**	**Time required for the Unit (Hours)**
1.	**Electronics Devices**	9
2.	**Transistor Amplifier and Operational Amplifier**	9
3.	**Feedback and Oscillator Circuits**	9
4.	**Number System and Boolean Algebra**	9
5.	**Analysis & Design of Combinational Logic**	9

C. **DETAILEDSYLLABUS**

Unit	Unit Details
1.	**Electronics Devices**
	• Introduction of Unit • P-N Junctions: Diode theory, Bipolar Junction Transistors (BJT): Transistor fundamentals, transistor Analog Electronics configurations, DC operating point, BJT characteristics & parameters, fixed bias, emitter bias with and without emitter resistance, analysis of above circuits and their design, variation of operating point and its stability. • Field-Effect Transistors (FET): JFET-current-voltage characteristics, effects in real devices, high-frequency and high-speed issues. • Conclusion and Summary of Unit
2.	**Transistor Amplifier and Operational Amplifier**
	• Introduction of Unit • Transistors Amplifier: Small Signal BJT amplifiers: AC equivalent circuit, hybrid, re model and their use in amplifier design. Multistage amplifiers, frequency response of basic & compound configuration, Power amplifiers: Class A, B, AB, C and D stages, IC output stages. • Operational Amplifiers: Op-Amp Basics, practicalOp-Ampcircuits,differentialandcommonmodeoperation,Inverting & Non Inverting Amplifier, differential and cascade amplifier, Op-Amp applications • Conclusion and Summary of Unit
3.	**Feedback and oscillator Circuits**
	• Introduction of Unit • Feedback & Oscillator Circuits Effect of positive and negative feedbacks, feedbacks, basic feedback topologies & their properties, properties, Analysis of practical feedback amplifiers, Sinusoidal Oscillators (RC, LC and Crystal), Multi-vibrators, The 555timer. • Conclusion and Summary of Unit
4.	**Number System and Boolean Algebra**
	• Introduction of Unit • NumberSystems:Decimal,binary,octal,hexadecimalnumbersystemandconversion,binaryweigh tedcodes,signed numbers, 1s and 2s complement codes, Binary arithmetic • BooleanAlgebra:Binarylogicfunctions, Booleanlaws, truthtables,associativeanddistributivep roperties, De-Morgans theorems, realization of switching functions using logic gates • Conclusion and Summary of Unit
5.	**Analysis & Design of Combinational Logic**
	• Introduction of Unit • Combinational Logic: Switching equations, canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, Quine-Mc Cluskey minimization technique, mixed logic combinational circuits, multiple output functions. • Analysis & design of Combinational Logic: Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers as function generators, binary adder, subs tractor, BCD adder, Binary comparator, arithmetic logic units

	● Sequential Logic, Sequential Circuits, Programmable Logic, Digital integrated circuits. ● Conclusion and Summary of Unit

D. **RECOMMENDED STUDYMATERIAL:**

Sr. No	Reference Book	Author	Editio	Publication
1.	Microelectronics Circuits	A.S. Sedra & K.C.Smith	Latest	Oxford University Press
2.	Electronic Principles	A.P.Malvino	Latest	TMH
3.	Electronic Devices & Circuit	RobertL.Boylestad&LouisNashelsky	Latest	Pearson
4.	Electronic devices and circuits	JacobMillman,andC.C.Halkias	Latest	TMH
5.	Digital Electronics	WilliamKleitz	Latest	PHI

Code: 25BSAESA5201	CHEMISTRY LAB-V	1.0 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level
CO1	Understand the mechanisms involved in the synthesis of organic compounds such as p-bromoacetanilide, p-nitroacetanilide, and aspirin.	Understand
CO2	Explain the principles of the chromatographic techniques.	Understand
CO3	Apply the principles behind conductometric measurements and their application in studying the saponification of ethyl acetate.	Apply
CO4	Describe the relationship between concentration and properties such as surface tension and conductivity in detergent solutions.	Understand
CO5	Apply solvent extraction techniques to separate mixtures of organic compounds.	Apply

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-	1	3	-	-
CO5	3	3	2	1	-	-	-	-	-	-	-	1	3	-	-
Wt. AVG	2.2	3	2.6	1	-	-	-	-	-	-	-	1	3	-	-

F. LIST OF EXPERIMENTS:

1	Synthesis of p bromoacetanalide
2	Synthesis of p-nitroacetanalide
3	Benzolytation of Aniline
4	Paper chromatographic separation of compounds in Spinach plant
5	To separate a mixture of sugar by paper chromatography
6	Synthesis of Aspirin
Physical Chemistry	
7	To determine the heat of neutralization for strong acid and strong base
8	Potentiometric measurements-Strong acid with strong base.
9	To study the saponification of ethyl acetate conductmetrically
10	Study the variation of surface tension with different concentration of detergent solutions. Determine CMC.
11	To separate mixture of organic compounds by solvent extraction.
12	Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant of a weak acid.

Code: 25BSAESA5202	PHYSICS LAB-V	1 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level
CO1	Learn the concept of RC and LC transmission lines at various frequencies.	Understand
CO2	Learn the concept of inverse square law and characteristics of GM counter	Understand
CO3	Learn the concept of Plank's and Stefan's constant using solar and photo cell	Understand
CO4	Learn the concept of LCR meter and determine the velocity of sound by standing wave method	Understand
CO5	Learn the concept of the magnetic susceptibility of solids and Hall coefficients of a semiconductor.	Understand

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	-	-	-	-	-	-	-	-	**3**	**3**	3	-	-
CO2	**2**	**1**	-	-	-	-	-	-	-	-	**2**	**1**	3	-	-
CO3	**1**	**2**	-	-	-	-	-	-	-	-	**1**	**2**	3	-	-
CO4	**2**	**1**	-	-	-	-	-	-	-	-	**2**	**1**	3	-	-
CO5	**3**	**3**	-	-	-	-	-	-	-	-	**3**	**3**	3	-	-
Avg Wt.	**2.2**	**2**	-	-	-	-	-	-	-	-	**2.2**	**2**	3	-	-

C. LIST OF EXPERIMENTS:

1.	Study of a R-C transmission line at 50 Hz.
2.	Study of a L-C transmission line (i) at fixed frequency (ii) at variable frequency.
3.	Study the characteristics of a GM counter and verification of inverse square law for the same strength of a radioactive source.
4.	Study of β- absorption in Al foil using GM counter.
5.	Determination of Planck constant using solar cell.
6.	Determination of Stefan's constant using photocell.
7.	Determination of e/m by helical method.
8.	Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO.
9.	Study of electromagnetic damping in LCR circuit using metal plate.
10.	Study the Iodine spectrum with the help of grating, spectrometer and ordinary bulb.
11.	To measure the Magnetic susceptibility of Solids.
12.	To determine the Hall coefficient of a semiconductor sample.

Code: 25BUACHM5114	PRSENTATION & INTERVIEW SKILLS	2.0 Credits [LTP: 2-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Describe human behavior, positive thinking, adaptability, and self-awareness in the context of workplace applications.	Understand
CO2	Write technical writing, formal letters, job applications, CV, business reports, and professional emails.	Apply
CO3	Show effective oral presentation and public speaking skills, including voice modulation, tone, and visual aids for business communications.	Apply
CO4	Practice appropriate interview etiquette, interview participation, and group discussion techniques.	Apply
CO5	Compare the distinctions between groups and teams, time and stress management strategies, long-term career planning, and negotiation techniques.	Analyse

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	3	2	-	1	-	-	3
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	-	2	3	1	-	-	-	-	1
CO4	-	-	-	-	-	3	-	2	1	-	-	-	-	-	1
CO5	-	-	-	-	-	-	-	3	2	1	-	-	-	-	1
Wt. Avg	3	2	1	-	-	3	-	2	2.2	1.3	-	1	-	-	2

B. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Professional Attitude & Approach**	**4**
2.	**Professional Writing- I**	**6**
3.	**Presentation Skills: Structure Study**	**4**
4.	**Interview Skills &Group Discussion**	**6**
5.	**Negotiation Skills &Time Management**	**5**

UNIT	UNIT NAME
1	**Professional Attitude & Approach**
	• Introduction to the Unit • Understanding Human behavior • Relationships between truth and beliefs • Positive Thinking • Adaptability and resilience • Adaptability in the workplace • Self -Awareness • Conclusion & Real-Life Application
2	**Professional Writing**
	• Introduction to the Unit • Technical Writing • Formal Letter Writing • Job applications • Notice Agenda and Minutes of Meeting • CV preparation (differences between Bio-Data, CV, and Resume) • Report Writing (Business Reports, Memo Reports) • Email Communication • Conclusion & Real-Life Application
3	Presentation Skills: Structure Study
	• Introduction to the Unit • Oral Presentation: Voice modulation, tone, describing a process • Presentation Skills: Oral presentation and public speaking skills • Business presentations • Preparation: organizing the material, Self-Introduction, introducing the topic, answering questions, individual presentation practice, and presenting visuals effectively. • Conclusion & Real-Life Application
4	**Interview Skills & Group Discussion**
	• Introduction to the Unit • Interview Skills: types of interviews, successful interviews, • Interview etiquette, dress code, body language • Online Job Interview: Telephone/online (skype) interviews • Offline Job Interviews: One-to-one interviews & panel interviews • Mock Interviews • Introduction to Group Discussion (GD) • Differences between GD and debate • Participating in GD, understanding GD, brainstorming the topic, questioning and clarifying • GD strategies • Conclusion & Real-Life Application
5	**Negotiation Skills & Time Management**
	• Introduction to the Unit • Recognizing differences between groups and teams • Time Management • Stress Management • Networking professionally • Respecting social protocols • Understanding career management • Develop a long-term career plan • Points of view

	● Agreement-Disagreement ● Discussion techniques ● Situations and negotiators ● Difficulties in negotiation and reaching an agreement ● Conclusion & Real-Life Application

A. RECOMMENDED STUDY MATERIAL

Sr. No	Reference Book	Author	Edition	Publication
1.	English for Engineers and Technologists	Rod Ellis	(Combined edition, Vol. 1 and 2)	1. Orient Blackswan 2010.
2.	The Elements of Style	William Strunk Jr. & E.B. White	4th Edition	Pearson, 1999.
3.	Technical Communications	Raman Sharma	London, 2004	Oxford Publication
4.	Success in Interview	Anand Ganguly	5 Edition, 2016	RPH

Code: 25BULCSE5201 SKILL ENHANCEMENT COURSE-V 2.0 Credits [LTP: 0-0-2]

Course: Artificial Intelligence using Python

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Implement classical search algorithms such as BFS and DFS for solving problem spaces.	Apply
CO2	Apply Python programming to model and solve real-life AI problems using game-based logic and state-space search.	Apply
CO3	Use heuristic and optimization-based techniques like A*, hill climbing, and alpha-beta pruning for decision-making problems.	Analyse
CO4	Develop rule-based AI systems including inference engines and simple chatbots.	Understand
CO5	Analyze and solve constraint satisfaction and logic-based problems using Python.	Analyse

B. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	-	-	1	-	2	1	3	1	1	-
CO2	3	3	3	2	2	-	-	1	-	2	2	3	1	1	-
CO3	3	3	3	3	2	-	-	1	-	2	2	3	1	1	-
CO4	2	2	2	3	2	1	-	2	2	3	2	2	1	1	-
CO5	3	3	3	2	3	-	-	1	1	2	2	3	1	1	-
Wt. Avg	2.8	2.6	2.8	2.4	2	1	-	1.2	1.5	2.2	1.8	2.8	1	1	-

DETAILED SYLLABUS

Sr. No.	LIST OF ACTIVITES
1	Implement Breadth First Search (BFS) for a graph or a maze problem using Python
2	Implement Depth First Search (DFS) for a graph or tree traversal using Python
3	Develop a Tic-Tac-Toe Game using Minimax Algorithm
4	Solve the 8-Puzzle Problem using BFS/DFS/Heuristic Search
5	Implement the Water Jug Problem using BFS or DFS
6	Solve Travelling Salesman Problem using Greedy/Brute Force method
7	Implement Tower of Hanoi using Recursion in Python
8	Solve the Monkey-Banana Problem using state-space search
9	Implement Alpha-Beta Pruning for a 2-player game scenario (e.g., Tic-Tac-Toe/Chess Tree)

10	Solve the 8-Queens Problem using Backtracking
11	Implement A* Search Algorithm for a pathfinding problem
12	Implement Hill Climbing Algorithm for optimization problems
13	Build a simple Chatbot using rule-based logic in Python
14	Implement a basic Decision Tree classifier using Python and test it on a dataset
15	Create a Knowledge Base and solve queries using Forward/Backward Chaining (rule-based inference)

Code: 25BSACSA5401	INDUSTRIAL TRAINING & SEMINAR	3 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level
CO1	Discuss the organizational structure of company/ Industry/ Institute	Understand
CO2	Prepare professional work report and presentations	Remembering
CO3	Develop the written communications and technical report writing skills.	Apply
CO4	Articulate the professional work report through presentations	Apply
CO5	Conclude the gained knowledge through final presentation and project report submission.	Evaluate

B. MAPPING MATRIX OF CO, PO, & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	1	-	1	-	2	3	-	2
CO2	1	1	-	1	-	-	-	1	-	1	-	2	3	-	-
CO3	-	-	-	-	2	-	-	1	-	2	-	2	3	-	-
CO4	-	-	-	-	2	-	-	1	2	2	-	2	3	-	2
CO5	-	-	2	-	2	-	-	1	-	2	2	2	3	-	2
WT. AVG	1	1	-	1	2	-	-	1	2	-	-	2.6	2.2	-	2

C. OUTLINE OF THE COURSE

1	At the end of the Fourth Semester, each student would undergo Industrial Training in an Industry/ Professional Organization / Research Laboratory with the prior approval of the Head of Department and Training & Placement Officer for two months.
2	Students shall be required to submit logbook and certificate from the organization and power point presentation based on the training.
3	Students shall be required to submit a written typed report and power point presentation based on the training.
4	Students shall be required to give the presentations in the allotted period about the training attended after 4th Semester.
5	The evaluation shall be done as per continuous evaluation process during V^{th} semester by the respective department and the marks/result shall be notified accordingly. A department specific panel comprising of **HOD/Sr. Faculty/ Project Coordinators** shall judge each individual student for the above-mentioned work. The departmental panel shall display the proper schedule for the class/ one to one interaction/presentation for all the students.

Code: 25BSACSA6101	QUANTUM MECHANICS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level
CO1	Comprehensive understanding and overview of the historical background and foundational concepts leading to the development of quantum mechanics.	Understand
CO2	Understanding of the mathematical formalism and physical implications of the Schrödinger equation, enabling them to analyze and solve a wide range of quantum mechanical problems.	Apply
CO3	Summary of key concepts and their applications, emphasizing the fundamental role of operators in quantum mechanics and their importance in describing and predicting physical phenomena at the quantum level.	Apply
CO4	Overview of bound state problems in quantum mechanics, focusing on systems where particles are confined to a region of space by a potential.	Understand
CO5	Introduction to the concept of the simple harmonic oscillator (SHO) in quantum mechanics, emphasizing its importance in various physical systems.	Understand

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	1	1	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
Wt. AVG	2.8	2.2	1.4	-	-	-	-	-	-	-	-	-	3	-	-

B. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Development of Quantum Mechanics**	**9**
2.	**Schrodinger Equations**	**9**
3.	**Operators in Quantum Mechanics and their Applications**	**9**
4.	**Bound State Problems**	**9**
5.	**Simple Harmonic Oscillator (1-D Case)**	**9**

D. DETAILED SYLLABUS

Unit No.	Unit Details
1.	**Development of Quantum Mechanics**
	• Introduction of the Unit • Black body radiation spectrum • Classical theory and its failure • Planck quantum hypothesis • Matter Waves: De Broglie hypothesis • Wave packet, Phase velocity and group velocity • Davison Germer experiment. • Heisenberg Uncertainty Principaland its application such as (i) Non existence of electron in nucleus, (ii) Ground state energy of H–atom, (iii) Ground state energy of harmonic oscillator (iv) Natural width of spectral line • Compton effect • Conclusion of the Unit
2.	**Schrodinger Equations**
	• Introduction of the Unit • Wave function and its interpretation, • Schrödinger time dependent and time independent one-dimensional equation, • Three-dimensional Schrödinger wave equation, • Probability current density, • Physical meaning of ψ, • Conditions to be satisfied by ψ. • particle in one dimensional box • Eigen function and eigen values • Discrete energy levels • Extension of results for three dimensional case and degeneracy of level. • Conclusion of the Unit
3.	**Operators in Quantum Mechanics and their Applications**
	• Introduction of the Unit • Definition of operator in quantum mechanics • Eigen function • Eigen value and Eigen value equation • Hermition operator • Parity operator • Exchange operator • Expected value • Normalization of wave function • Orthogonally of wave function • Stationary states • Commutation relations

	• Ehrenfest's theorem • Bohr's principle of complementarity • principle of superposition • Conclusion of the Unit
4.	**Bound State Problems**
	• Introduction of the Unit • Potential step • Rectangular potential barrier • Calculation of reflection and transmission coefficient • Qualitative discussion of the application to alpha decay (tunnel effect) • square well potential problem, • calculation of transmission coefficient • Resonant scattering • Conclusion of the Unit
5.	**Simple Harmonic Oscillator (1-D Case)**
	• Introduction of the Unit • Schrödinger equation and its solutions, • Eigen function, • Energy eigen values. • Zero point energy, • Parity, • Symmetric and anti-symmetric wave functions with graphical representation. • **Rigid rotator**: Schrodinger equation and its solution. • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Quantum Mechanics: A Textbook for Undergraduates students	Mahesh C. Joshi	2009	PHI
2.	Quantum Physics of Atoms, Molecules, Solid, Nuclei and Particles	Eisberg and R. Resnick	1985	John Wiley & Sons, Singapore
3.	Quantum Mechanics & Modern Physics	Mahipal Singh	2008	Ram Prasad & Sons, Agra

Code: BSASCSA6102	PHYSICAL CHEMISTRY	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Evaluate photochemical and photophysical processes using Jablonski diagram and their quantum yield expressions.	Evaluate
CO2	Understand the selection rules in rotational and vibrational spectra.	Understand
CO3	Describe the fundamental concepts of electrochemistry and relate the conductivity of an electrolyte with its concentration.	Understand
CO4	Demonstrate the mechanisms of unimolecular and bimolecular reactions at surfaces using Gibbs, Freundlich and Langmuir isotherm.	Apply
CO5	Apply foundational concepts of Quantum Mechanics, covering black body radiation to the Schrödinger wave equation for the hydrogen atom.	Apply

a. MAPPING MATRIX OF CO, PO & PSO

B.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-	3	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	-	3	-	-	-	-	-	-	-	-	-	3	-	-
WT. AV G	2.6	2	1.2	1.5	-	-	-	-	-	-	-	-	3	-	-

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Photochemistry**	**9**
2.	**Spectroscopy**	**9**
3.	**Electrochemistry-I**	**9**
4.	**Electrochemistry-II**	**9**
5.	**Quantum Mechanics**	**9**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Photochemistry**
	● Introduction to the Unit. ● **Photochemistry:** Interaction of radiation with matter, difference between thermal and photochemical processes. ● Laws of photochemistry: Grothus-Drapper law, Stark-Einstien law ● Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non radiative process (internal conversion, inter system crossing) quantum yield, photosensitized reaction-energy transfer process (simple examples) ● Conclusion & real life application
2.	**Spectroscopy**
	● Introduction to the Unit. ● Spectroscopy I: Electromagnetic radiation of the spectrum, basic features of different spectrometers, statement of the Born Oppenheimer approximation, degree of freedom. ● Rotational spectrum: Diatomic molecules, Energy levels of rigid rotator, (semiclassical principles) selection rules, spectral intensity, distribution using population distribution (Maxwell Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotator, isotope effect. ● Vibrational spectrum: Energy levels of simple harmonic oscillator, selection rules, pure ● vibrational spectrum, intensity, determination of force constant, qualitative relations of force constants and bond energy, effect of anharmonic motion and isotopes on the spectrum, idea of vibrational frequencies of different functional groups. ● Conclusion & real life application
3	**Electrochemistry-I**
	● Introduction to the Unit ● Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. ● Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald dilution law its uses and limitations. ● Debye Huckel– Onsager`s equation for strong electrolytes (elementary treatment only). n
4	**Electrochemistry-II**
	● Introduction to the Unit. ● Types of reversible electrodes, gas metal ion, metal-metal ion, metal insoluble salt-anion and redox electrodes. ● Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance. ● EMF of a cell and its measurements. Computation of cells EMF. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K),polarization, over potential and hydrogen overvoltage. ● Electrolytic and galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cell ● Conclusion & real life application
5	**Quantum Mechanics**

	● Introduction to the Unit ● Quantum Mechanics I: Black body radiation, Planck`s radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. ● Compton Effect. De Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. ● Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions. ● Conclusion & real life application

E. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	● Fundamentals of Molecular Spectroscopy	C. M. Banwell and E. McCash	4th Edition	Tata McGraw Hill
2.	Spectrometric Identification of Organic Compounds	Robert M. Silverstein, Francis X. Webster, David Kiemle	7th Edition	Wiley
3.	Applications of Spectroscopic techniques in Organic Chemistry	P.S. Kalsi	6th Edition	New Age International
4	Physical Chemistry	Bahl and Tuli	Latest	S. Chand

Code: 25BSACSA6103	COMPLEX ANALYSIS	3.0 Credits [LTP: 3-0-0]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO 01	Define the significance of complex functions, concept of limit, continuity and differentiability of complex functions.	Remember
CO 02	Explain the analytic functions leading to the understanding of Cauchy−Riemann equations.	Apply
CO 03	Determine some elementary functions and valuate the contour integrals	Apply
CO 04	Categorize some simple functions as their Taylor and Laurent series	Analyze
CO 05	Explain the application of residues ad its properties, definite integral by contour integration.	Apply

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	1	2	3	-	-		-	-	-	-	-	-	3	-	-
CO5	1	3	1	2	-		-	-	-	-	-		3	-	-
WT. AVG	2	2.2	1.6	2	-	-	-	-	-	-	-	-	3	-	-

B. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Continuity and Differentiability**	**9**
2	**Analytic Functions**	**9**
3	**Complex Integration**	**9**
4	**Taylor's and Laurent's Theorem**	**9**
5	**Residues Integration**	**9**

C. DETAILED SYLLABUS

Unit	Unit details
1	**Continuity and Differentiability**
	● Introduction to the Unit ● Complex plane, Connected and Compact sets, Curves and regions in complex plane, ● Jordan Curve theorem (Statement only), Complex valued function, ● Limits, Limits involving the point at infinity, continuity and differentiability ● Conclusion of the Unit
2	**Analytic Functions**
	● Introduction to the Unit ● Analytic functions, Cauchy-Riemann equations (Cartesian And polar form), ● Sufficient conditions for differentiability, ● Harmonic Function, ● Construction of an analytic function. ● Conclusion of the Unit
3	**Complex Integration**
	● Introduction to the Unit ● Complex integration, Complex line integral, ● Cauchy integral theorem, ● Fundamental theorem of integral calculus for complex functions, ● Cauchy integral formula, Liouville's theorem ● Conclusion of the Unit
4	**Taylor's and Laurent's Theorem**
	● Introduction to the Unit ● Taylor's Theorem, Laurent's theorem, ● Power series, Taylor series, Laurent series, ● Absolute convergence, Abel's theorem, Circle and radius of Convergence, ● Conclusion of the Unit
5	**Residues Integration**
	● Introduction to the Unit ● Residues theorem, ● Singular point, Poles ● Application of residues to evaluate real integral ● Evaluation of real definite integral by contour integration (Simple problems only) ● Conclusion of the Unit

D. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Complex Variables and Applications	James Ward Brown and Ruel V. Churchill,	8th Ed.	McGraw – Hill International Edition, 2009.

2.	Complex analysis,	Joseph Bak and Donald J. Newman	2nd Ed	Springer-Verlag New York,
3.	Complex Analysis	Purohit and Goyal	2016	Jaipur Publishing House

Code: 25BUACHM6115 ENTREPRENEURIAL AND MANAGERIAL SKILLS 2.0 Credits [LTP: 2-0-0]

A. COURSE OUTCOMES

Course Outcome	At the end of this course, students will be able to:	Bloom Level
CO1	Explain the integrated awareness of Entrepreneurship and its link to professional life.	Understand
CO2	Employ the concepts of Entrepreneurship Development and various Entrepreneurship models.	Apply
CO3	Describe the role of effective leadership in organizational strategy and leadership styles in dynamic environments.	Understand
CO4	Interpret Presentation & Interview Skills behaviors and issues relating to leadership.	Understand
CO5	Practice practical, ethically-informed leadership skills applicable in a range of situations.	Apply

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	—	—	3	—	2	1	—	—	—	—	1	1
CO2	-	-	-	2	—	-	-	—	—	3	—	—	—	-	2
CO3	-	-	-	—	1	-	-	—	2	3	—	—	—	1	2
CO4	-	-	-	-		-	-	1	3	2	—	—	—	-	3
CO5	-	-	-	-		-	-	—	2	—	—	1	—	-	3
Wt Avg	-	-	-	-		-	-	1.5	1.6	1.6	-	1	-	1	2.2

B. OUTLINE OF THE COURSE

UNIT NO.	UNIT NAME	Time required for the Unit (Hours)
1	**Professional Attitude & Approach**	**6**
2	**Professional Writing-I**	**6**
3	**Presentation Skills: Structure Study**	**6**
4	**Interview Skills & Group Discussion**	**6**
5	**Negotiation Skills & Time Management**	**6**

C. DETAILED SYLLABUS

Unit	Unit Details
1.	**Entrepreneurship**
	● Introduction to the Unit ● Concept of Entrepreneur. Intrapreneur, Entrepreneurship and Manager ● Difference between Entrepreneur and Intrapreneur, Entrepreneur and Entrepreneurship. Attributes and Characteristics of successful entrepreneurs. Functions of an Entrepreneur ● Classification of Entrepreneurs. Role of Entrepreneur in Indian Economy, Developing entrepreneurial culture, Factors influencing Entrepreneurship Growth - Economic, Non-Economic Factors, For profit or Not for profit entrepreneurs, Constraints for the Growth of Entrepreneurial Culture, Entrepreneurship as a career ● Entrepreneurship as a style of management, Emerging Models of Corporate Entrepreneurship, India's start up revolution–Trends, Imperatives, benefits; the players involved in the ecosystem, Business Incubators-Rural ● Entrepreneurship, social entrepreneurship, women entrepreneurs, Cases of Tata, Birlas, Kirloskar and new generation entrepreneurs in India. ● Conclusion & Real-life applications
2.	**Entrepreneurship development**
	● Introduction to the Unit ● Entrepreneurial Competencies, Developing Competencies. ● Concept of entrepreneurship development, Entrepreneur Training and developing, Role of Entrepreneur Development Programs (EDP) ● Objectives – contents – methods - execution. Role of Mentors ● Innovation and Entrepreneurship, Design Thinking Process. Role of consultancy organizations in promoting Entrepreneurs ● Problems and difficulties of Entrepreneurs - Marketing Finance, Human Resource, Production; Research - external problems ● Mobility of Entrepreneurs, Entrepreneurial change, occupational mobility - factors in mobility ● Conclusion & Real-life applications
3.	**Leadership Styles: Effective Vs. Successful Managers**
	● Introduction to the Unit ● Types of Leadership Style ● Types of Management Styles ● Distinction between Effective Leadership and Effective Management ● Conclusion & Real-life applications
4.	**Behavioral theory of Leadership**
	● Introduction to the Unit ● Definition of Behavioral Theory ● Classification of Behavioral theory ● Conclusion & Real-life applications
5.	**Leadership Styles: Case Study and Adaptation**

	• Introduction to the Unit • Peter Weaver Case Study • Dealing with Crisis: Case Study • Arsenic and Old Lace Case Study • Conclusion & Real-life applications

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Leadership Development	John Mitchell	*2012*	Mitchell Leadership Consulting
2.	Leading Minds: An Anatomy of Leadership	Howard E. Gardner and Emma Laskin	*2011*	Kogan Page
3.	Start with Why: How Great Leaders Inspire Everyone to Take Action,	Simon Sinek	2011	Portfolio

Code: 25BUACHM6235	LEADERSHIP COMMUNICATION LAB	1 Credit [LTP: 0-0-2]

A. COURSE OUTCOMES

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Show the skills for reporting educational qualifications, skills & expertise sections on social media	Apply
CO2	Identify the stages of the writing process and formatting process	Understand
CO3	Analyze the presentation's weak spots and areas for improvement.	Analyze
CO4	Use various strategies and personal skills to perform well in interviews and Group Discussions.	Apply
CO5	Practice negotiation and team management skills and their mutual dynamics.	Apply

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	0	3	2	3	2	2	-	1	3
CO2	2	3	2	2	3	1	0	2	1	3	2	2	-	1	3
CO3	2	3	3	3	2	1	0	2	2	3	1	2	-	1	3
CO4	2	2	2	2	2	2	1	3	3	3	2	2	-	1	3
CO5	1	2	2	2	2	2	2	3	3	3	3	2	-	1	3
WT. AVG	2	2.4	2.2	2	2.2	1.4	1.5	2.6	2.2	3	2	2	-	1	3

UNIT NO.	Title of the Unit	Time required for the Unit (Hours)
1	**Branding and Leadership**	**2**
2	**Professional Writing and Leadership**	**8**
3	**Presentation Skills and Corporate Leadership**	**2**
4	**Interview & Group Discussion: Preparation by Mock Practice**	**4**
5	**Negotiation Skills, Team Management & Professional Awareness**	**8**

List of Labs

1.	Introduction to Personal Branding and ways to create a brand. How to improve social media visibility for career growth
2.	Learning Communication and Professional Writing including formatting process.
3.	Informal communication, non-verbal cues, Speakers vs communicators
4.	Leaders and Professional Appearance, ways to improve presentation skills. Planning your presentation, building, audio-visual aids, giving presentation, audience rapport, and overcoming stage fright.
5.	How leaders communicate, skills of a good communicator.
6.	40-question self-assessment, making sure your message matters, choosing your words, improving your skills
7.	Definition of defensive/non-defensive communication & 5 skills for communicating non-defensively.
8.	Definition of feedback, giving feedback, 10 common feedback mistakes, 5 tips on receiving feedback, 10 tips for dealing with difficult people.
9.	Barriers to listening, what is listening, listening vs hearing, bad listening habits, active listening. Preparing for Interview, Mock Practice
10.	Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics
11.	When to use/not use e-mail, e-mail etiquette, when to use/not use telephone and video conferencing, 7 tips on telephone etiquette
12.	Team Management and Negotiation Skills. How to improve negotiation Skills

Code: 25BULCSE6201	SKILL ENHANCEMENT COURSE-VI	1.0 Credit [LTP: 0-0-2]

Course: Automate & Maintain Lab

D. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Remember the basic components of computer hardware and office software.	Remembering
CO2	Understand the functionality of productivity tools like Word, Excel, PowerPoint, etc.	Understanding
CO3	Apply troubleshooting steps to resolve basic PC hardware issues.	Applying
CO4	Analyze system configurations and office document structures for efficiency.	Analyzing
CO5	Create professional documents, presentations, and data reports using office tools.	Evaluating

E. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	–	–	3	–	–	–	–	2	–	2	3	3	2
CO2	2	3	2	2	3	2	–	2	–	2	–	3	2	3	3
CO3	2	3	3	–	3	–	–	2	3	2	2	3	2	3	3
CO4	3	3	3	3	3	2	–	–	–	2	2	3	3	2	3
CO5	2	3	3	2	3	2	–	2	2	3	2	3	3	3	3
WT. AVG	2.4	2.8	2.75	2.25	3.0	2.0	–	2.0	2.5	2.2	2.0	2.8	2.6	2.8	2.8

Sr. No.	LIST OF ACTIVITES
1	Professional Resume Creation using MS Word
2	Invoice Generation using MS Excel Functions
3	Sales Data Visualization using Charts in MS Excel
4	Create a Presentation with Multimedia Effects in MS PowerPoint
5	Mail Merge using Word and Excel
6	Assembling a Basic Desktop Computer System
7	Installing Windows Operating System
8	Checking and Replacing Faulty RAM Module
9	Diagnosing and Troubleshooting Boot Failure
10	Connecting and Configuring Peripheral Devices

Code: 25BULCSE6202	SKILL ENHANCEMENT COURSE-VII	2 Credits [LTP: 0-0-2]

Course: Data Science and Analytics

A. COURSE OUTCOMES

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Apply Numbly and Pandas libraries for efficient data handling and manipulation.	Apply
CO2	Visualize datasets using appropriate plots to derive initial insights.	Understand
CO3	Perform descriptive statistical analysis on real-world datasets.	Analyze
CO4	Conduct statistical hypothesis testing using Z-test, T-test, and ANOVA.	Apply
CO5	Build and evaluate basic predictive models including linear and logistic regression.	Apply

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	1	-	2	2	3	1	-	-
CO2	2	2	2	2	3	1	1	1	-	3	1	2	1	-	-
CO3	3	3	3	2	2	-	1	1	-	2	2	3	1	-	-
CO4	2	3	3	3	2	-	1	2	1	2	2	3	1	-	-
CO5	3	3	3	2	3	1	1	2	2	3	2	3	1	-	-
WT. AVG	2.6	2.6	2.6	2	2.6	1	1	1.4	1.5	2.4	1.8	2.8	1	-	-

DETAILED SYLLABUS

Sr. No.	LIST OF ACTIVITES
1	Introduction to NumPy Arrays (Creation, indexing, slicing, reshaping)
2	Working with Pandas DataFrames (Loading, cleaning, merging datasets)
3	Data Visualization using Matplotlib (Line, bar, pie, and histogram plots)
4	Statistical Analysis: Frequency Distributions and Central Tendencies (mean, median, mode)
5	Measuring Variability (range, variance, standard deviation, IQR)
6	Normal Distribution and Z-scores (Curve plotting and probability)
7	Scatter Plots and Correlation Coefficient Calculation (Pearson, Spearman)
8	Simple Linear Regression (Model fitting, residuals, R^2 score)
9	Z-test (One and two-sample testing with visualization)

10	T-test (Independent and paired t-tests for sample comparison)
11	ANOVA (One-way analysis with multiple group mean comparison)
12	Logistic Regression (Binary classification, confusion matrix, ROC)
13	Model Validation Techniques (Train/test split, cross-validation, MSE, MAE)
14	Time Series Analysis (Trend, seasonality, plotting, decomposition)
15	Exploratory Data Analysis (EDA): Summary stats, handling missing data, boxplots
Software Requirements	Operating Systems: Windows 7 or higher Software: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Code: 25BSACSA6401	DISSERTATION	5 Credits [LTP: 0-0-12]

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Identify the research problem through literature review	Remember
CO2	Develop the solution to the research problem	Understand
CO3	Investigate the various complex problems based on the analysis	Analyze
CO4	Plan, implement and execute the project	Apply
CO5	Defend technical information by means of written and oral reports	Evaluate

A. MAPPING MATRIX OF CO, PO & PSO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	2	2	2	2	2	-	-	-	-	-	1	1	-
CO2	2	3	3	2	2	2	2	-	-	-	-	-	2	-	-
CO3	2	3	3	3	3	2	2	-	-	-	-	1	2	2	-
CO4	3	3	3	3	3	2	2	-	-	-	-	-	3	3	3
CO5	3	3	3	3	3	2	2	-	-	-	-	1	3	3	3
WT. AVG	2.5	3	2.8	2.6	2.6	2	2	-	-	-	-	1	2.2	2.2	3

B. OUTLINE OF THE COURSE

1	Dissertation consist of finalization of thesis based on literature review carried out during semester break of third year.
2	Objective finalization & presentation
3	Design & experimentation/survey details
4	Thesis preparation and submission with plagiarism report
5	Final presentation

Code: 25BSACSA7101	MATHEMATICAL PHYSICS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students will be able:
CO1: Analyze the knowledge of the coordinate transformation.
CO2: Role plays the mechanism of Tensors & Dirac delta function.
CO3: Acquire knowledge of the Fourier series and apply it to different transformations.
CO4:Point out the concepts and potential applications of Differential equations of second order & Special Functions
CO5: Prepare the mechanism of partial differential equations & boundary value problems.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	–	–	–	–	–	–	–	–
CO2	2	2	3	3	–	–	–	–	–	–	–	–
CO3	3	3	2	2	–	–	–	–	–	–	–	–
CO4	3	2	3	2	–	–	–	–	–	–	–	–
CO5	2	2	–	1	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

•	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	2	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A.OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Coordinate Transformation**	**8**
2.	**Tensors & Dirac Delta Function**	**7**
3.	**Fourier Series**	**7**
4.	**Differential Equations of Second Order & Special Functions**	**7**
5.	**Partial Differential Equations & Boundary Value Problems**	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Coordinate Transformation**
	• Introduction to the Unit • Differential operator • Laplacian operator • Cylindrical co-ordinates • Spherical (Polar) coordinates • Transformation of cylindrical polar coordinates into i,j,k • Conversion of spherical polar coordinates (r, ɵ, ϕ) into i,j,k. • Relation between cylindrical and polar coordinates • Conclusion of unit
2.	**Tensors & Dirac Delta Function**
	• Introduction to the Unit • Coordinate transformations • Transformation of covariant, contra variant and mixed tensors • Addition, subtraction, outer product , contraction and inner product of tensors • Quotient law • Symmetric and anti symmetric tensors • Metric tensor • Dirac delta function and its representation • Dirac delta function in three Dimensions • Derivative of Dirac delta function and its properties • Conclusion of unit
3.	**Fourier Series**
	• Introduction to the Unit • Even and Odd Functions • Complex Form of Fourier Series, Analysis of Periodic Waveforms • Fourier series with respect to an orthogonal function • Orthogonality of cosine series • Fourier integral theorem • Fourier transforms and its properties • Cosine and sine transforms • Complex transform • Conclusion of unit
4.	**Differential Equations of Second Order & Special Functions**
	• Introduction to the Unit • The second order linear differential equation with variable coefficient and singular points • Series solution method • Its application to the Hermite, Lagendre and Laguerre differential equations • Basic properties like orthogonality, recurrence relation, graphical representation and generating function of Hermite, Legendre ,Leaguere functions (simple applications) • Conclusion of unit

5.	**Partial Differential Equations & Boundary Value Problems**
	• Introduction to the Unit • Laplace equation and its solution • Solution of Laplace equation in Cartesian coordinate system, boundary value problem • Solution of Laplace equation in spherical coordinate system, boundary value problem • Diffusion equation for Fourier equation of heat flow, boundary value problem • Wave equation in spherical polar coordinates-the vibrations of a circular membrane • Solution of Helmholtz equation in cylindrical co-ordinates • Conclusion of unit

A. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Mathematical Physics	H.K. Dass& Dr. Rama Verma	Latest	S. Chand & Company
2.	Introduction to Mathematical Physics	S Chandra, M. K. Sharma	2005	Narosa
3	Mathematical Physics	B. S. Rajput	1995	Pragati Edition

Code: 25BSACSA7102 STEREOCHEMISTRY 3.0 Credits [LTP:

COURSE OUTCOMES: The Students will be able:

CO1: Predict, identify and distinguish between various types of stereogenic units present in the molecules.

CO2: Predict major/minor stereoisomers in a given asymmetric reaction.

CO3: Propose/write a mechanism for a given organic reaction.

CO4: Design experiments to determine reaction intermediates/mechanisms.

CO5: Gains preliminary knowledge of NMR spectroscopic technique.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	2	3	2	3	-	-	-	-	-	-	-	-
CO4	2	3	2	3	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A.OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Basic concept of stereochemistry	7
2.	Element of symmetry	8
3.	Configuration & nomenclature	7
4.	Conformational analysis of cycloalkanes	7
5.	Topicity and Prochirality	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic concept of stereochemistry**
	• Introduction of the Unit • Stereochemistry- Definition • Terminology used in stereochemistry • Representation of three dimensional molecules • Stereoselectivity and stereospecificity • Conclusion of the unit
2.	**Element of symmetry**
	• Introduction of the Unit • Chirality • chiral auxilliary, diastereotopic induction • Stereogenic unit: Center of chirality, axis of chirality, plane of chirality and helicity. • Stereochemistry of - allenes, spirans, biphenyls, cyclophanes, ansa compounds, trans-cyclooctene, helicenes, benzphenanthrenes. • Conclusion of the unit
3.	**Configuration & nomenclature**
	• Introduction of the Unit • D/ L system of nomenclature • Erythro and threo system of nomenclature • R/S. nomenclature • Principles of asymmetric synthesis, Cram's rule, Felkin's model, Prelog's rule • Conclusion of the unit
4.	**Conformational analysis of cycloalkanes**
	• Introduction of the Unit • Cyclohexane • mono-substituted cyclohexanes • disubstituted cyclohexanes • Effect of conformation on reactivity Decalins • Conformational analysis of sugars • Anomeric effect. • Conclusion of the unit
5.	**Topicity and Prochirality**
	• Introduction of the Unit • Topicity of ligands and faces. • Diastereotopic ligands and NMR spectroscopy. • Chemical reactivity of heterotropic ligands and faces with chiral and achiral reagents. • Resolution of racemates., chiral auxilliary, diastereotopic induction • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Stereochemistry of Organic compounds,	Nasipuri D.	1991	Wiley Eastern
2.	Reaction mechanism in Organic Chemistry	Mukherji S.M. and Singh S.P.	latest	Mcmillan.

Code: 25BSACSA7103	DISCRETE MATHEMATICS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students will be able:

CO1: Explain the concept of Sets, Cardinality, Principle of inclusion and exclusion, Mathematical Induction, relations, equivalence relations and partition, Denumerable sets, partial order relations, Pigeon Hole Principle.

CO2: Demonstrate Propositions, logical operations, logical equivalence, Conditional propositions, Tautologies and contradictions also Quantifier, Predicates and Validity.

CO3: Analysis the Boolean algebra, Lattices and Algebraic Structure, Duality, Lattices, Chains and antichains, Distributive and complemented lattices, Boolean lattices, Boolean functions.

CO4: Evaluate Basic terminology of Graphs and their properties.

CO5: Evaluate Basic terminology of Trees and their properties.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	–	–	–	–	–	–	–	–
CO2	3	3	2	-	–	–	–	–	–	–	–	–
CO3	3	2	2	–	–	–	–	–	–	–	–	–
CO4	3	3	2	–	–	–	–	–	–	–	–	–
CO5	2	2	1	–	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	**1**	-
CO2	3	-	-
CO3	3	1	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Set Theory**	**9**
2	**Propositions and logic**	**6**
3	**Boolean Algebra**	**6**
4	**Graph Theory**	**8**
5	**Trees**	**7**

B. DETAILED SYLLABUS

Unit	Unit details
1	**Set Theory**
	• Introduction to the Unit • Sets, Cardinality, Principle of inclusion and exclusion, • Mathematical Induction, relations, equivalence relations and partition, • Denumerable sets, partial order relations, • Pigeon Hole Principle and its applications. • Conclusion of the unit
2	**Propositions and logic**
	• Introduction to the Unit • Propositions, logical operations, logical equivalence, • Conditional propositions, • Tautologies and contradictions. • Quantifier, Predicates and Validity • .Conclusion of the unit
3	**Boolean Algebra**
	• Introduction to the Unit • Boolean Algebra, Lattices and Algebraic Structure, • Duality, Lattices, Chains and antichains, • Distributive and complemented lattices, • Boolean lattices, Boolean functions and expressions. • Conclusion of the unit
4	**Graph Theory**
	• Introduction to the Unit • Graphs- Basic terminology, • Multigraphs, weighted graph, • Paths and circuits, • Shortest paths, Introduction to Eulerianand Hamiltonian Graphs. • Conclusion of the unit
5	**Trees**
	• Introduction to the Unit • Trees- Properties, Spannig Tree, Binary and Rooted Tree, • Diagraphs- Simple diagraph, • Asymmetric diagraphs and complete diagraphs. Diagraphs and binary relation • Matrix representation of graphs and diagraphs. • Conclusion of the unit

C RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Finite Mathematics	Seymour Lipschutz	1983	McGraw- Hill Book Company, New York.
2.	Elements of Discrete Mathematics	C.L. Liu	2nd Ed	McGraw-Hilll Book Co.
3.	Graph theory with applications to computer science,	N. Deo	2016	Prentice Hall of India

Code: 25BSACSA7104	SOLID STATE PHYSICS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students will be able:

CO1: Differentiate the crystal structure of different elements by X ray diffraction.
CO2: Apply the Thermal Properties of solids and its applications.
CO3: Produce the different magnetic materials, B-H Curve, Hysteresis loop and Energy Loss
CO4: Use the electrical properties of materials, energy band theory and Hall Effect and its applications.
CO5: Develop the types of superconductor and different theories for explaining it.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	–	–	–	–	–	–	–	–
CO2	3	3	3	2	–	–	–	–	–	–	–	–
CO3	2	2	2	3	–	–	–	–	–	–	–	–
CO4	3	3	2	2	–	–	–	–	–	–	–	–
CO5	3	3	3	3	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

•	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Crystal Structure**	**8**
2	**Thermal Properties of Solids**	**7**
3	**Magnetic Properties**	**7**
4	**Electrical Properties of Materials**	**7**
5	**Superconductivity**	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Crystal Structure**
	• Introduction of the Unit • Solids: Amorphous and Crystalline Materials • Lattice Translation Vectors • Lattice with a Basis – Central and Non-Central Elements • Unit Cell. Reciprocal Lattice • Types of Lattices • Miller indices • Crystal structures of simple cubic, FCC, BCC, HCP, diamond. • Diffraction of x-rays by Crystals • Bragg's Law • Rotating crystal method • Laue Method and Powder method • Conclusion of the unit
2.	**Thermal Properties of Solids**
	• Introduction of the Unit • Concepts of thermal energy and Phonons • Internal Energy and Specific Heat • Einstein theory of specific heat • Debye model of lattice specific heat Electronic Contribution of the internal Energy hence to the Specific Heat of Metals • Thermal Conductivity of the lattice • Electrical Conductivity: Drude-Lorentz Theory of Electrical Conductivity • Boltzmann Transport Equation • Sommerfield Theory of Electrical Conductivity • Mathiessen's Rule • Thermal Conductivity and Wildemann-Franz's Law • Conclusion of the unit
3.	**Magnetic Properties**
	• Introduction of the Unit • Dia-, Para-, Ferri- and Ferromagnetic Materials • Classical Langevin Theory of dia – and Paramagnetic Domains • Quantum Mechanical Treatment of Paramagnetism • Curie's law • Weiss's Theory of Ferromagnetism and Ferromagnetic Domains • Discussion of B-H Curve • Hysteresis loop and Energy Loss • Outline of antiferromagnetism andferrimagnetisms, ferrites • Conclusion of the unit
4.	**Electrical Properties of Materials**
	• Introduction of the Unit • Elementary Band Theory of Solids • Bloch Theorm

	• Kronig-Penney Model • Effective Mass of Electron • Concept of Holes,Band Gaps • Energy Band Diagram and Classification of Solids • Law of Mass Action • Band Theory of Solids • Direct and Indirect Band Gap • Conductivity in Semiconductors. • Hall Effect in Semiconductors (Qualitative Discussion Only) • Conclusion of the unit
5.	**Superconductivity**
	• Introduction of the Unit • Experimental Results • Critical temperature • Critical magnetic field • Meissner effect • Type I and type II Superconductors • London's Equation and Penetration Depth • Isotope effect • Idea of BCS theory (No derivation): Cooper Pair and Coherence length • Variation of Superconducting Energy Gap with Temperature • Experimental Evidence of Phonons • Josephson Effect • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Introduction to Solid State Physics	Charles Kittel	7th Edition	John Wiley and Sons, Inc.
2.	Solid State Physics	A. J. Dekkar	2000	Macmillan India Limited

Code: 25BSACSA7105	BIOCHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students will be able:
CO1: Explain the importance of minerals to live
CO2: Explain Metal ion binding to biomolecules and their functions
CO3: Recognize iron-containing biological molecules
CO4: Recognize Mg-containing chlorophyll
CO5: Recognize Nitrogen-containing biological molecules

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	-	-	-	-	-	-	-	2
CO2	3	2	3	-	-	-	-	-	-	-	-	2
CO3	2	3	3	1	-	-	-	-	-	-	-	-
CO4	2	3	2	3	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

•	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Metal storage and transport system-I	7
2.	Metal storage and transport system-II	7
3.	Haemoglobin & Myoglobin	7
4.	Photosystems	8
5.	Nitrogen Fixation	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Metal storage and transport system-I**
	• Introduction of the Unit • Elements in living systems • Porphyrin ring • Metalloporphyrin • Role of iron in living system • Metal storage transport and biominiralation ferritin, transferrin and siderrophores • Conclusion of the unit
2.	**Metal storage and transport system-II**
	• Introduction of the Unit • Storage of iron-ferritin • Transport of iron-transferrins • Siderophores • Iron-containing proteins with porphyrin ligand systems • Conclusion of the unit
3.	**Haemoglobin & Myoglobin**
	• Introduction of the Unit • Haemoglobin • Properties hemoglobin • Biological roles of the hemoglobin • Function of hemoglobin in the human body • Structure of the hemoglobin • Myoglobin • Structure of the myoglobin • The dioxygen-binding reaction • Cooperative effect • Bohr's effect • Heme models • Conclusion of the unit
4.	**Photosystems**
	• Introduction of the Unit • Photosynthesis • Phase of photosynthesis • Role of photosystem I and Photosystem II • Mechanism of light dependent reduction • Generation of ATP via cyclic electron flow • Conclusion of the unit
5.	**Nitrogen Fixation**

	• Introduction of the Unit • Nitrogen Fixation • Type of nitrogen fixation • Physical nitrogen fixation • Biological nitrogen fixation • Basic requirement of nitrogen fixation • Mode of action of nitrogenase • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Bioinorganic chemistry	Ivano Bertini, Harry B. Gray, Stephen J. Lippard, and Joan Selverstone Valentine	Latest	LibreTexts
2.	Biophysical Chemistry,	Gurtu-Gurtu,	Latest	Pragati Edition

Code: 25BSACSA7106	LINEAR ALGEBRA	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students will be able:

CO1: Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.

CO2: To understand orthogonality, orthogonal bases, orthogonal and orthonormal bases, explain the Gram-Schmidt orthogonalization process.

CO3: Explain a linear transformation and bases, find a matrix representation for the linear transformation

CO4: Compute eigen values and eigen vectors of linear transformations and find consistency and inconsistency of system of linear equations.

CO5: Demonstrate diagonalization and Jordan block.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	–	–	–	–	–	–	–	–
CO2	3	3	1	-	–	–	–	–	–	–	–	–
CO3	3	2	2	–	–	–	–	–	–	–	–	–
CO4	3	3	2	–	–	–	–	–	–	–	–	–
CO5	2	2	1	–	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	**2**	-
CO2	3	-	-
CO3	3	1	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Vector Spaces – I**	**6**
2	**Vector Spaces – II**	**7**
3	**Linear Transforms**	**8**
4	**System of linear equations**	**8**
5	**Diagonalizable matrix and J.C form**	**8**

B DETAILED SYLLABUS

Unit	Unit details
1	**Vector Spaces – I**
	• Vector spaces, • Subspaces, • Linear Combinations, Linear span, Linear dependence and • Linear independence of vectors, • Basis and Dimension, • Finite dimensional vector space.
2	**Vector Spaces – II**
	• Inner product spaces, length • Orthogonal vectors • Orthogonal complement • Gram-Schmidt Process
3	**Linear Transforms**
	• Linear maps as matrices, • Change of basis • Kernel and Image of a linear transformation, • Rank and Nullity theorems. • Singular and non-singular linear transformations,
4	**System of linear equations and Eigen value, Eigen vector**
	• Introduction • Eigen values and Eigen vectors • Consistency and inconsistency of non homogeneous and homogeneous system of linear equations • Conclusion of the unit
5	**Diagonalizable matrix and J.C form**
	• Introduction • Diagonalization of matrix • Jordan block • Rules for number of Jordan block • Conclusion of the unit

C.RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Linear Algebra	Sergr Lang	Latest	Addison Wesley Publishing company Inc.
2.	Brief Survey of Modern Algebra,	Brikhoff and Maclane	Latest	IBH

Code: BSACSA7107	RESEARCH METHODOLOGY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students will be able:

CO1: To analyze and prove relationships of statistical data with techniques
CO2: To analyze Measures and applications of Central Tendency.
CO3: To utilize methods of estimation for data
CO4: To apply the research problem for real application
CO5: To create or design the research problem from the various types of data

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	—	—	—	—	—	—	—	—	1
CO2	3	3	—	-	—	—	—	—	—	—	—	2
CO3	3	2	1	—	—	—	—	—	—	—	—	—
CO4	3	3	3	—	—	—	—	—	—	—	—	—
CO5	2	2	-	—	—	—	—	—	—	—	—	2

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A.OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Introduction to Statistics**	**7**
2	**Central of Tendency**	**8**
3	**Estimation**	**8**
4	**Research problem**	**8**
5	**Research Designs**	**8**

A. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Statistics**
	• Introduction of Unit • Introduction to Statistics; Data Types and sources; • Population vs. Sample, • Scales of Measurement, and Data representation techniques. • Conclusion of Unit
2.	**Central of Tendency**
	• Introduction of Unit • Measures and applications of Central Tendency • Simple linear regression • Coefficient of Correlation • Conclusion of the Unit
3.	**Estimation**
	• Introduction of Unit • Method of Estimation, Interval Estimation, • Confidence Interval-I& II, • Formulating the research hypothesis- • Types of Research hypothesis • Conclusion of the Unit
4.	**Research problem**
	• Introduction of Unit • Defining the Research problem; • Problem identification process; • Components of the research problem • Conclusion of the Unit
5.	**Research Designs**
	• Introduction of Unit • Meaning of Research Designs; • Nature and Classification of Research • Exploratory Research Designs • Case study Method • Conclusion of the Unit

C.RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Research Methodology	R. Panneerselvam	Latest	PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari	Latest	Tata McGraw-Hill.
3	Business Statistics	JK Sharma	Latest	PEARSON: New Delhi.

Code: 25BSACSA7208	WRITING & PRESENTATION SKILLS	2.0 Credits [LTP: 0-0-4]

COURSE OUTCOMES: Students will be able

CO: To understand the literature survey for various types of data
CO2: To analyze the how to write and read a scientific research paper
CO3: To evaluate the research paper in form of publication
CO4: To write a technical paper in terms of abstract, discussion, conclusion etc.
CO5: To create or design the presentation of the paper

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	—	—	2	—	—	—	—	—	1
CO2	3	3	—	-	—	2	—	—	—	—	—	1
CO3	3	2	-	—	—	1	—	—	—	—	—	—
CO4	3	3	-	—	—	2	—	—	—	—	—	—
CO5	2	2	-	—	—	2	—	—	—	—	—	2

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Literature survey**	7
2	**How to study a scientific paper**	8
3	**Publishing a paper**	8
4	**Technical writing**	8
5	**Presentations skills**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Literature survey**
	• Introduction of Unit • Overview – What is literature survey, • Functions of literature survey, • Methods of data collection – Observation, survey, • Conclusion of the Unit
2	**How to study a scientific paper**
	• Introduction of Unit • Summarizing paper – Reading abstracts and finding ideas, conclusion, • Advantages of their • approach, the draw backs of the papers • Conclusion of the Unit
3	**Publishing a paper**
	• Introduction of Unit • How to write scientific paper Structure of a conference and journal paper, • how (and HowNot) to write a Good Systems Paper: Abstract writing, chapter writing, discussion, • conclusion, references, bibliography, • Conclusion of the unit
4	**Technical writing**
	• Introduction of Unit • discussion of technical writing • examples, Poster papers, review papers, how to organize thesis Project report, How to • Write a research proposal? How research is funded? • Conclusion of unit
5	**Presentations skills**
	• Introduction of Unit • Talk structure, basic presentations skills Documentation and presentation tools LATEX, • Microsoft office, • PowerPoint and other • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Essentials Of Research Methodology & Dissertation Writing	KananYelikar, Jaypee Brothers	Latest	Medical Publishers
2.	Technical Writing	B.N Basu	Latest	PHI
3	Crtical Thinking, Academic Writing and Presentation	Marilyn Anderson, PramodNayar, MadhucchandaSen,	Latest	PEARSON: New Delhi.

Code: 25BSACSA7201	CHEMISTRY LAB-VII	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES: The Students will be able:

CO1: Understand M-L bonding in coordination compounds

CO2: Synthesis of metal complexes

CO3: Acquire the ability to understand, explain and use instrumental techniques forchemical analysis.

CO4: Application of High performance liquid chromatography

CO5: Apply subject knowledge and skill to solve complex problems with defined solutions

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

List of Experiments:

1	Synthesis of prussian blue
2	Estimation of vitamin C by titration with potassium bromate
3	Separation and determination of Fe (III) and Mg (II) /Zn (II) using ethyl acetate /ether as a solvent
4	Determination of nitrite in a water sample by colorimetric method
5	Preparation of $[Ni(en)_3]S_2O_3$, $[Ni(H_2O)_6]Cl_2$, and $[Ni(NH_3)_6]Cl_2$ and studying their absorption spectra.
6	Determination of iron by solvent extraction techniques in a mixture of Fe^{+3}, Al^{+3} & Ni^{+3} using 8 - hydroxyquinoline reagent
7	The determination of caffeine in a beverage using HPLC.
8	Synthesis of Chloro penta-ammino cobalt (III) chloride
9	Ion – exchange chromatography; Separation & estimation of (Zn^{+2}/ Cd^{+2}) & (Zn^{+2} / Mg^{+2}) in mixtures using Amberlite IRA 400 anion exchanger
10	Determination of Keq of M – L systems in Fe (III) – Salicylic acid
11	Analysis of Fe(III) – β – resorcilic acid by Job's &Mole ratio method
12	Synthesis of Tris, 2-4 pentanedionato cobalt (III)trihydrate

Code: BSACSA7202	PHYSICS LAB	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students will be able to:

CO1: Learn the constants of elasticity by the help of different methods.
CO2: Learn the concept of Poisson's ratio and surface tension of water
CO3: Learn conversion of Galvanometer to Ammeter and Voltmeter
CO4: Learn to evaluate of RLC and CR, DC circuits
CO5: Identify and calculate the magnetic field around a current carrying circular coil

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	2	–	–	–	–	–	–	3	2
CO2	2	3	–	–	–	–	–	–	–	–	2	3
CO3	2	3	–	–	–	–	–	–	–	–	2	3
CO4	–	3	–	2	–	–	–	–	–	–	–	3
CO5	3	3	–	–	–	–	–	–	–	–	3	3

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development/ Entrepreneur

List of Experiments

1	To determine the coefficient of thermal conductivity of Cu by Angstrom's Method.
2	To determine the wavelength of laser light using diffraction of single slit.
3	To determine the ionization potential of mercury.
4	To determine the refractive index of a dielectric layer using SPR
5	Measurement of rise, fall and delay times using a CRO.
6	To calibrate resistance temperature device (RTD) using Null method/Off balance bridge.
7	To study a precision Differential amplifier Of given I/O specification using Op-amp.
8	To determine g by bar pendulum.
9	To setup the Millikan oil drop apparatus & determine the charge of an electron.
10	To measure Q of a coil & its dependence on frequency, using Q meter.

Code:25BSACSA7204 DATA ANALYSIS USING STATISTICAL PACKAGE FOR SOCIAL SCIENCES (SPSS) 1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students will be able:

- CO1 To Students' familiarity with the tool box of statistical software
- CO2 To analyze the Descriptive statistics for various categories
- CO3 To utilize methods of various Statistical techniques
- CO4 To evaluate the various Statistical techniques for hypotheses analysis
- CO5 To analyze the Multivariate statistical Techniques

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	—	—	—	—	—	—	—	—	3	1
CO2	3	—	—	-	—	—	—	—	—	—	2	2
CO3	3	2	—	—	—	—	—	—	—	—	3	—
CO4	3	3	—	—	—	—	—	—	—	—	2	2
CO5	2	2	—	—	—	—	—	—	—	—	3	2

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Introduction to SPSS	7
2	Preliminary Analysis	8
3	Statistical techniques-I	8
4	Statistical techniques-II	8
5	Multivariate statistical techniques	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to SPSS**
	• Introduction of Unit • Type of Scale of Measurements, choosing appropriate scale and measurement to the data, Preparing codebook. • Getting to Know SPSS: Starting SPSS, Working with data file, • SPSS windows, Menus, Dialogue boxes. • Preparing the Data file: Creating data file and entering data, • Defining the variables, entering data, modifying data file, import file. • Conclusion of the unit
2.	**Preliminary Analysis**
	• Introduction of Unit • Descriptive statistics: Categorical variables, continuous • variables, checking normality, outliers checking. • Choosing the right statistics: Overview of different • statistical techniques, Decision making process • Conclusion of the unit
3.	**Statistical techniques-I**
	• Introduction of Unit • Correlation: Pearson product moment correlation, • Spearman rank correlation, Partial correlation, Simple • linear regression, • Conclusion of the unit
4.	**Statistical techniques-II**
	• Introduction of Unit • One sample and two independent sample t test, Paired • sample t test, One way Analysis of variance, Two way • ANOVA, • Conclusion of the unit
5.	**Multivariate statistical Techniques**
	• Introduction of Unit • Logistic Regression and Discriminant Analysis, Factor • Analysis, Cluster Analysis • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	SPSS for Intermediate Statistics: Use and Interpretation	Nancy L. Leech	Latest	Lawrence Erlbaum Associates, Inc.
2.	Using IBM SPSS statistics for research methods and social science statistics	William E. Wagner	Latest	SAGE Publications, Inc.

Code:25BSACSA7401	MINOR PROJECT-I	2.0 Credits [LTP: 0-0-4]

COURSE OUTCOMES: Students will be able to:

CO1: Identify literature for review and research methods.
CO2: Apply knowledge and understanding in relation to the agreed area of study.
CO3: Communicate in written form by integrating, analysing and applying key texts and practices.
CO4: Develop responses on the basis of the evaluation and analysis undertake.
CO5: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	–	–	3	–	–	–	–	–	–	–	2	3
CO2	-	–	2	–	–	–	–	–	–	-	–	2
CO3	–	–	3	–	–	–	–	–	–	–	–	1
CO4	–	–	3	2	–	–	–	–	–	–	–	3
CO5	–	–	3	2	–	–	–	–	–	–	–	3

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

1	Project consist of finalization of report based on literature review and research
2	Objective finalization & presentation
3	Design & experimentation/survey details
4	Spiral project report preparation and submission
5	Final presentation

Code: 25BSACSA8101	CONDENSED MATTER PHYSICS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students will be able to:

CO1: Differentiate between different Lattice types and explain the concepts of reciprocal lattice and crystal diffraction

CO2: Predict electrical and thermal properties of solids and explain their origin

CO3: Explain the concept of energy bands and effect of the same on electrical properties

CO4: Explain various types of magnetic phenomenon, physics behind them properties and applications.

CO5: Explain superconductivity, its properties, important parameters related to possible applications

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	-
CO2	2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	2	3	3	-	-	-	-	-	-	-	-
CO4	2	2	3	3	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	2	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Crystal Structure	9
2.	Electrical and Thermal Properties	10
3.	Concept of Energy Band	10
4.	Magnetism	11
5.	Superconductivity	10

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Crystal Structure**
	• Introduction of Nano science, • Fundamental types of lattices-two and three dimensional lattice types • SC, BCC and FCC unit cells, Miller indices • Diffraction of x-rays by crystals • Scattered wave amplitude-Fourier analysis • Reciprocal lattice vectors, Diffraction conditions • Laue equations, Brillouin Interpretation • Structure factor and Atomic form factors • Conclusion of unit •
2.	**Electrical and Thermal Properties**
	• Introduction of Nano science • Drude theory, DC conductivity • Hall effect and magneto-resistance • AC conductivity, thermal conductivity, Fermi-Dirac distribution • Free electron gas in three dimension, thermal properties of an electron gas Wiedemann Franz law • Vibration of lattice with monoatomic and diatomic basis: Dispersion relation, • Optical and acoustical branches • Quantization of elastic waves: Phonon, Classical theory of Specific heat. • Average energy of harmonic oscillator, Phonon Density of states • Einstein and Debye models of specific heat. Electronic contribution to specific heat • Anharmonic effect: thermal expansion, Phonon collision process, Thermal conductivity • Conclusion of unit
3.	**Concept of Energy Band**
	• Introduction of Nano science • Nearly free electron model and origin of energy gap, magnitude of gap • Bloch function, Kronig-Penny model, • Wave equation of electron in periodic potential, Bloch theorem and crystal momentum • Classification of metal, insulator and semiconductors. \ • Dielectrics: Dielectric properties of insulators, Types of polarizations, Local field • Claussius Mossotti equation, Dielectric constant and loss • Conclusion of unit
4.	**Magnetism**
	• Introduction of Nano science • Types of magnetism, Susceptibility, Permeability and their relation. Diamagnetism: Langevin Quantum theory of Diamagnetism.

	• Paramagnetism: Quantum Theory, Paramagnetism of rare earth and iron group ions, • Crystal field Splitting and quenching of orbital angular momentum. • Paramagnetism of conduction electrons. Ferromagnetism, Ferrimagnetism and Antiferromagnetism: Curie point and exchange integral • Saturation magnetization. Ferromagnetic Domains and their origin • Conclusion of unit
5.	**Superconductivity**
	• Introduction of Nano science • Superconductivity, critical temperature, Meissner effect, Destruction of superconductivity by magnetic field, Type I and type II superconductors, Isotope effect, energy gap, London equation, London penetration depth, BCS theory of superconductivity, Coherence length • Conclusion of unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Introduction to Solid State Physics	C. Kittel	2007	John Willey
2.	Elementary Solid State Physics	M. A. Omar	1999	Pearson Education
3.	Elements of Solid State Physics	J. P. Srivastava	2008	Prentice Hall of India
4.	Solid State Physics	N. W. Ashcroft and N. D. Mermin	2008	Cengage Learning

Code: BSACSA8102	ORGANOMETALLIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students will be able to: :

CO1: Basic understating of coordination chemistry
CO2: To explain the Alkyls and Hydrides compounds
CO3: To explain the Carbonyls, Phosphines, and Substitution compounds
CO4: To explain the Pi-Complexes
CO5: To explain the Oxidative Addition and Reductive Elimination

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	-
CO4	2	3	2	1	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Coordination chemistry	5
2.	Alkyls and Hydrides	6
3.	Carbonyls, Phosphines, and Substitution	6
4.	Pi-Complexes	7
5.	Oxidative Addition and Reductive Elimination	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Coordination chemistry**
	• Introduction of the Unit • Werner Complexes • The Trans Effect • Soft versus Hard Ligands • The Crystal Field • The Ligand Field • The sd_n Model and Hypervalency • Back Bonding • Electroneutrality • Types of Ligand • Conclusion of the unit
2.	**Alkyls and Hydrides**
	• Introduction of the Unit • Alkyls and Aryls • Other σ-Bonded Ligands • Metal Hydrides • Sigma Complexes • Bond Strengths • Conclusion of the unit
3.	**Carbonyls, Phosphines, and Substitution**
	• Introduction of the Unit • Metal Carbonyls • Phosphines • N-Heterocyclic Carbenes • Dissociative Substitution • Associative Substitution • Redox Effects and Interchange Substitution • Photochemical Substitution • Counterions and Solvents in Substitution • Conclusion of the unit
4.	**Pi-Complexes**
	• Introduction of the Unit • Alkene and Alkyne Complexes • Allyls • Diene Complexes • Cyclopentadienyl Complexes • Arenes and Other Alicyclic Ligands • Isolobal Replacement and Metalacycles • Stability of Polyene and Polyenyl Complexes, • Conclusion of the unit
5.	**Oxidative Addition and Reductive Elimination**

	• Introduction of the Unit • S_N2 Pathways • Radical Mechanisms • Ionic Mechanisms • Reductive Elimination • σ-Bond Metathesis • Oxidative Coupling and Reductive Fragmentation • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publication
1	The organometallic Chemistry of the Transition metals	Robert h. Crabtree	Sixth Edition	Wiley
2	Introduction to Organometallic Chemistry	M. S. Balakrishna & Prasenjit Ghosh	Latest	LibreTexts

Code: BSACSA8103	SAMPLING DISTRIBUTION & HYPOTHESIS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students will be able to:

CO1: Describe the basic concepts of statistical inference terminologies and its uses.
CO2: Implement the estimation procedures of sampling distribution
CO3: Apply testing of hypothesis and its application in the statistical domain.
CO4: Apply the concepts of hypothesis testing in parametric and nonparametric methods.
CO5: Describe the importance of point estimation and its application in the hypothesis.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	–	–	–	–	–	–	–	–
CO2	3	3	2	-	–	–	–	–	–	–	–	–
CO3	3	2	1	–	–	–	–	–	–	–	–	–
CO4	3	3	2	–	–	–	–	–	–	–	–	–
CO5	2	2	2	–	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	3	-	-
CO3	3	1	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Basic concepts of sampling	6
2	Sampling Distributions	7
3	Hypothesis	8
4	Testing Hypothesis	8
5	Parameter Estimation	8

B.DETAILED SYLLABUS

Unit	Unit details
1	**Basic concepts of sampling**
	• Introduction to the Unit • History and development of statistical hypothesis, introduction to statistical hypothesis, • types of hypotheses – simple and composite, fundamental concepts of null hypothesis, • Alternative hypothesis, critical region, • Conclusion & real-life application
2	**Sampling Distributions**
	• Introduction to the Unit • Sampling, Parameter and Statistics • Aim of Sampling Type of Sampling • Sampling Distributions- Sampling Distributions of mean, sampling Distributions of variance. • Conclusion & real life application
3	**Hypothesis**
	• Introduction to the Unit • Null and alternative hypothesis • level of significance • confidence level and critical region, most powerful test • Conclusion & real-life application
4	**Testing Hypothesis**
	• Introduction to the Unit • Introduction to Testing of hypothesis, steps involved in Hypothesis testing, • Small sample test: t test for one sample mean and two sample mean. • Large sample test : Z test, single mean, two mean, single • Conclusion &real life application
5	**Parameter Estimation**
	• Introduction To Unit • Introduction to estimation, types of estimation, properties of good estimator – unbiasedness, consistency • Method of estimation – maximum likelihood estimation • Conclusion &real life application

C.RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	SPSS for Intermediate Statistics: Use and Interpretation	Nancy L. Leech	Latest	Lawrence Erlbaum Associates, Inc.
2.	Using IBM SPSS statistics for research methods and social science statistics	William E. Wagner	Latest	SAGE Publications, Inc.

Code:25BSACSA8104	NANOTECHNOLOGY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able

CO1: To enable the students to understand the science of nanomaterial
CO2: To enable students to understand properties of bulk and nanomaterials
CO3: To enable students to understand the different methods of synthesis of nonmaterial
CO4: To enable students to understand the instrumental techniques for characterization of nanomaterial
CO5: To enable students to understand the applications of nano materials and associated technology in industrial

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Nano science: Introduction and Types	9
2.	Properties of Nanomaterials	10
3.	Synthesis of Nanomaterials	10
4.	Characterization Techniques	11
5.	Industrial Application of Nanomaterials	10

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Nano science: Introduction and Types**
	• Introduction of Nano science • Emergence of Nano science with special reference to Feynman and Drexler • Role of particle size, Spatial and temporal scale • Exciton, Concept of confinement, strong and weak confinement with suitable examples • Development of quantum structures • Nano clusters, Solid solutions, Thin film, Nano composites (Metal Oxide and Polymer based) Core Shell Nanostructure, Bucky balls, Carbon Nano tubes and, Zeolites minerals, Dendrimers • Micelles, Liposomes, Block Copolymers, Porous Materials, ,Metal Nano crystals ,Semiconductor nanomaterial • Conclusion of unit n
2.	**Properties of Nanomaterial**
	• Introduction of Nano science • Electronic: Classification of materials: Metal, Semiconductor, Insulator, Band structures, Brillouin zones, Mobility, resistivity, relaxation time, and recombination centers, Origin of magnetic Moment in materials • Magnetic: Dia, para, ferro magnetic, Domain structure, antiferro, feri & superparamagnetism, nanomagnetic materials: Fe, Fe3O4, Ferrites, Ferro-fluids • Optical: hoto-conductivity, Photovoltaic effect, optical absorption & transmission, photoluminescence, fluorescence, phosphorescence, electroluminescence, LED, Concept of phonon, thermal conductivity • Thermal: specific heat, exothermic & endothermic heat, Thermoelectric effect, Thermoelectric material(TEM) properties • Mechanical: Stress- Strain curve, True Stress True strain, Hardness, compressive & tensile strengths, Fracture toughness Fatigue, Creep and other elastic properties of materials, Deformation behavior of Nanomaterials • Conclusion of unit
3.	**Synthesis Of Nanomaterials**
	• Introduction of Nano science • Physical Methods: Physcal Vapour Deposition (PVD), Inert gas condensation, Arc discharge, DC sputtering, Ion sputtering, RF & Magnetron sputtering, Pulse Laser Deposition (PLD), Ball Milling, Molecular beam epitaxial, Electro-deposition, • Chemical Methods: Metal Nano crystals by reduction, Sol- gel, Solvothermal synthesis Photochemical synthesis, Electrochemical synthesis, Nanocrystals of semiconductors and other materials by arrested precipitation, Thermolysis routes, Liquid-liquid interface • Self-assembly and Lithography: Self-assembly, Process of self-assembly, colloids, Introduction to Lithography, E-beam Lithography. • Conclusion of unit
4.	**Characterization Techniques**

	• Introduction of Nano science • Structural characterization techniques X-ray diffraction (XRD) technique, particle size determination using XRD, Applications of XRD, Electron diffraction and its application, neutron diffraction and its applications • Optical and Electron Microscopy Introduction to Optical microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy • Spectroscopic Techniques UV visible spectroscopy, Infrared Spectroscopy and Fourier Transform Infrared Spectroscopy, Raman Spectroscopy, Photoluminescence (PL), Photoelectron Spectroscopy (X-Ray Photoelectron Spectroscopy, Auger Electron Spectroscopy & Ultra Violet Photoelectron Spectroscopy) • Conclusion of unit
5.	**Industrial Application Of Nanomaterials**
	• Introduction of Nano science • Nano-Electronic Technologies: Nano capacitors, Quantum tunneling, Single electron transistors, Coulomb blockade, Nano lithography, Data storage, Nano-photonics, Nano electronic and Magnetic devices, Spintronic, Carbon based materials: Carbon Nano-tube (CNC), Graphene. Sensors & Nano-sensors. • Accelerator Technologies: Introduction to Accelerators, Accelerating cavities and RF measurement, Superconducting materials, Niobium, Niobium-copper and other advance composite materials, NbN, NbAlGa, Mg3B • Sustainable energy technologies Solar energy, Hydrogen energy and Nano-materials, Carbon nanotube fuel cells, Hydrogen storage, Thermoelectricity, Re-chargeable batteries, Energy savings, Nano-lubricants, Nano-composites and Nano-catalysts • Conclusion of unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Introduction to Nanotechnology	Charles P. Poole, Jr., Frank J. Owens	2009-2012	GOI-UND Disaster Risk Program
2.	Chemistry of nanomaterials: Synthesis, properties and applications	CNR Rao et.al.		Wiley VCH Verlag Gmbh & Co, Weinheim
3.	Nanostructure and Nanomaterials: Synthesis , Properties and Application	G. Cao,	2004	Imperial College Press

Code: 2 5 BSACSA8105	ANALYTICAL CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Explain the fundamentals of analytical chemistry and steps of a characteristic analysis.
CO2: Expresses the tools of analytical chemistry in science.
CO3: Expresses language of Analytical Chemistry.
CO4: Expresses the Gravimetric Methods of Analysis.
CO5: Expresses the Titrimetric Methods of Analysis.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-
CO3	2	3	3	1	-	-	-	-	-	-	-	-
CO4	2	2	3	1	-	-	-	-	-	-	-	-
CO5	3	2	3	-	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction to Analytical Chemistry	8
2.	Basic Tools of Analytical Chemistry	6
3.	The Language of Analytical Chemistry	8
4.	Gravimetric Methods of Analysis	7
5.	Titrimetric Methods of Analysis	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Analytical Chemistry**
	• Introduction of the Unit • Analytical Perspective • Common Analytical Problems • Quantitative analysis • Characterization analysis • Fundamental analysis • Conclusion of the unit
2.	**Basic Tools of Analytical Chemistry**
	• Introduction of the Unit • Fundamental Units of Measure • Significant Figures • Units for Expressing Concentration • Stoichiometric Calculations • Basic Equipment and Instrumentation • Preparing Solutions • Conclusion of the unit
3.	**The Language of Analytical Chemistry**
	• Introduction of the Unit • Analysis, Determination, and Measurement • Techniques, Methods, Procedures, and Protocols • Classifying Analytical Techniques • Selecting an Analytical Method • Developing the Procedure • Compensating for Interferences • Calibration and Standardization • Importance of Analytical Methodology • Conclusion of the unit
4.	**Gravimetric Methods of Analysis**
	• Introduction of the Unit • Overview of Gravimetry • Types of Gravimetric Methods • Precipitation Gravimetry • Volatilization Gravimetry • Conclusion of the unit
5.	**Titrimetric Methods of Analysis**

	• Introduction of the Unit • Overview of Titrimetry • Titrations Based on Acid–Base Reactions • Titrations Based on Complexation Reactions • Titrations Based on Redox Reactions • Precipitation Titrations • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Modern Analytical Chemistry	David Harvey	2000	McGraw-Hill Higher Education
2.	Analytical Chemistry	Christian, Gary D	7th	Wiley

Code: 2 5 BSACSA8106	INTEGRAL TRANSFORMATION	3.0 Credits [LTP: 3-0-0]

Course Outcome: Students will be able to:

CO1: Explain the use Laplace transform is an integral transform method, which is particularly useful in solving linear ordinary differential equations.

CO2: Explain the use of designing electrical circuits, solving differential equations, signal processing, and signal analysis, image processing & filtering.

CO3: Explain the use of Pole-zero description of the discrete-time system, Analysis of linear discrete signal, analysis digital filter, find the frequency response, obtain impulse response estimation, Determine the difference equation, Analysis of discrete signal, Calculation of a signal to control system.

CO4: Explain the use Signal Processing. It may be the best application of Fourier analysis, Approximation Theory. We use Fourier series to write a function as a trigonometric polynomial, Control Theory, Partial Differential equation.

CO5: Determine the extremes of functional and solve the simple problems of the calculus of variations.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	–	–	–	–	–	–	–	–
CO2	3	3	2	-	–	–	–	–	–	–	–	–
CO3	3	2	1	–	–	–	–	–	–	–	–	–
CO4	3	3	2	–	–	–	–	–	–	–	–	–
CO5	2	2	2	–	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Laplace Transforms	7
2	Fourier Transforms	7
3	Z- Transforms	7
4	Fourier series	8
5	Calculus of Variation	7

B DETAILED SYLLABUS

Unit	Unit details
1	**Laplace Transforms**
	• Introduction of the Unit • Existence theorem for Laplace transforms. • Properties of Laplace transform, • Convolution theorem. • Application of Laplace transform to differential equation • Conclusion of the Unit
2	**Fourier Transforms**
	• Introduction of the Unit • Infinite Fourier transforms, • Fourier sine transforms. • Fourier cosine transforms. • Inverse Fourier transform • Conclusion of the Unit
3	**Z- Transforms**
	• Introduction of the Unit • Definition, properties and formulae, • Convolution theorem, • Inverse Z-transform, • Application of Z transform to difference equation • Conclusion of the Unit
4	**Fourier series**
	• Introduction of the Unit • Periodic functions, • Fourier series of periodic functions with period 2π and with arbitrary period 2c. • Fourier series of even and odd functions. • Half range Fourier Series, practical harmonic analysis • Conclusion of the Unit
5	**Calculus of Variation**
	• Introduction of the Unit • Functional, strong and weak variations, • Simple variation problems, • Euler's equation • Conclusion of the Unit

C RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Higher Engineering Mathematics	B.S. Grewal	43rd Ed.,	Khanna Publishers,
2.	Advanced Engineering Mathematics,	E. Kreyszig	10th Ed., 2015	John Wiley & Sons,

Code: 25BSACSA8401	RESEARCH PROJECT-II	10.0 Credits [LTP: 0-0-20]

COURSE OUTCOMES: Students will be able to:
CO1: Identify literature for review and research methods.
CO2: Apply knowledge and understanding in relation to the agreed area of study.
CO3: Communicate in written form by integrating, analysing and applying key texts and practices.
CO4: Develop responses on the basis of the evaluation and analysis undertake.
CO5: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	–	–	3	–	–	–	–	–	–	–	2	3
CO2	-	–	2	–	–	–	–	–	–	-	–	2
CO3	–	–	3	–	–	–	–	–	–	–	–	1
CO4	–	–	3	2	–	–	–	–	–	–	–	3
CO5	–	–	3	2	–	–	–	–	–	–	–	3

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

A. OUTLINE OF THE COURSE

1	Research project consist of thesis based on literature review and research work
2	Objective finalization & presentation
3	Design & experimentation/survey details
4	Thesis preparation and submission with research paper
5	Final presentation