B Sc CHEMISTRY

LOCF SYLLABUS 2025

Department of Chemistry

School of Physical Sciences

St. Joseph's College (Autonomous)

Tiruchirappalli - 620002, Tamil Nadu, India

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS) UNDERGRADUATE COURSES

St. Joseph's College (Autonomous), an esteemed institution in the realm of higher education in India, has embarked on a journey to uphold and perpetuate academic excellence. One of the pivotal initiatives in this pursuit is the establishment of five Schools of Excellence commencing from the academic year 2014-15. These schools are strategically designed to confront and surpass the challenges posed by the 21st century.

Each School amalgamates correlated disciplines under a unified umbrella, fostering synergy and coherence. This integrated approach fosters the optimal utilization of both human expertise and infrastructural assets. Moreover, it facilitates academic fluidity and augments employability by nurturing a dynamic environment conducive to learning and innovation. Importantly, while promoting collaboration and interdisciplinary study, the Schools of Excellence also uphold the individual identity, autonomy, and distinctiveness of every department within.

The overarching objectives of these five schools are as follows:

1. Optimal Resource Utilization: Ensuring the efficient use of both human and material resources to foster academic flexibility and attain excellence across disciplines.

2. Horizontal Mobility for Students: Providing students with the freedom to choose courses aligning with their interests and facilitating credit transfers, thereby enhancing their academic mobility and enriching their learning experience.

3. Credit-Transfer Across Disciplines (CTAD): The existing curricular structure, in accordance with regulations from entities such as TANSCHE and other higher educational institutions, facilitates seamless credit transfers across diverse disciplines. This underscores the adaptability and uniqueness of the choice-based credit system.

4. Promotion of Human Excellence: Nurturing excellence in specialized areas through focused attention and resources, thus empowering individuals to excel in their respective fields.

5. Emphasis on Internships and Projects: Encouraging students to engage in internships and projects, serving as stepping stones toward research endeavors, thereby fostering a culture of inquiry and innovation.

6. Addressing Stakeholder Needs: The multi-disciplinary nature of the School System is tailored to meet the requirements of various stakeholders, particularly employers, by equipping students with versatile skills and competencies essential for success in the contemporary professional landscape.

In essence, the Schools of Excellence at St. Joseph's College (Autonomous) epitomize a holistic approach towards education, aiming not only to impart knowledge but also to cultivate critical thinking, creativity, and adaptability – qualities indispensable for thriving in the dynamic global arena of the 21st century.

Credit system

The credit system at St. Joseph's College (Autonomous) assigns weightage to courses based on the hours allocated to each course. Typically, one credit is equivalent to one hour of instruction per week. However, credits are awarded regardless of actual teaching hours to ensure consistency and adherence to guidelines.

The credits and hours allotted to each course within a programme are detailed in the Programme Pattern table. While the table provides a framework, there may be some flexibility due to practical sessions, field visits, tutorials, and the nature of project work.

For undergraduate (UG) courses, students are required to accumulate a minimum of 137 credits, as stipulated in the programme pattern table. The total number of courses offered by the department is outlined in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)

OBE is an educational approach that revolves around clearly defined goals or outcomes for every aspect of the educational system. The primary aim is for each student to successfully achieve these predetermined outcomes by the culmination of their educational journey. Unlike traditional methods, OBE does not prescribe a singular teaching style or assessment format. Instead, classes, activities, and evaluations are structured to support students in attaining the specified outcomes effectively.

In OBE, the emphasis lies on measurable outcomes, allowing educational institutions to establish their own set of objectives tailored to their unique context and priorities. The overarching objective of OBE is to establish a direct link between education and employability, ensuring that students acquire the necessary skills and competencies sought after by employers.

OBE fosters a student-centric approach to teaching and learning, where the delivery of courses and assessments are meticulously planned to align with the predetermined objectives and outcomes. It places significant emphasis on evaluating student performance at various levels to gauge their progress and proficiency in meeting the desired outcomes.

Here are some key aspects of Outcome-Based Education:

Course: A course refers to a theory, practical, or a combination of both that is done within a semester.

Course Outcomes (COs): These are statements that delineate the significant and essential learning outcomes that learners should have achieved and can reliably demonstrate by the conclusion of a course. Typically, three or more course outcomes are specified for each course, depending on its importance.

Programme: This term pertains to the specialization or discipline of a degree programme.

Programme Outcomes (POs): POs are statements that articulate what students are expected to be capable of by the time they graduate. These outcomes are closely aligned with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs outline the specific skills and abilities that students should possess upon graduation within a particular discipline or specialization.

Programme Educational Objectives (PEOs): PEOs encapsulate the expected accomplishments of graduates in their careers, particularly highlighting what they are expected to achieve and perform during the initial years postgraduation.

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The Learning Outcomes-Centric Framework (LOCF) places the learning outcomes at the forefront of curriculum design and execution. It underscores the importance of ensuring that these outcomes are clear, measurable, and relevant. LOCF orchestrates teaching methodologies, evaluations, and activities in direct correlation with these outcomes. Furthermore, LOCF adopts a backward design approach, focusing on defining precise and attainable learning objectives. The goal is to create a cohesive framework where every educational element is in harmony with these outcomes.

Assessment practices within LOCF are intricately linked to the established learning objectives. Evaluations are crafted to gauge students' achievement of these outcomes accurately. Emphasis is often placed on employing authentic assessment methods, allowing students to showcase their learning in real-life scenarios. Additionally, LOCF frameworks emphasize flexibility and adaptability, enabling educators to tailor curriculum and instructional approaches to suit the diverse needs of students while ensuring alignment with the defined learning outcomes.

Some Important Terminologies

Core Course (CC): *Core Courses represent obligatory elements within an academic programme, imparting fundamental knowledge within the primary discipline while ensuring consistency and acknowledgment.*

Allied Course (AC): *Allied Courses complement primary disciplines by furnishing supplementary knowledge, enriching students' understanding and skill repertoire within their academic pursuit.*

Skill Enhancement Course (SEC): *Skill Enhancement Courses aim to nurture students' abilities and competencies through practical training, open to students across disciplines but particularly advantageous for those in programme-related fields.*

Value Education (VE): *Value education encompasses the teaching of moral, ethical, and social values to students, aiming to foster their holistic development. It instills virtues such as empathy, integrity, and responsibility, guiding students towards becoming morally upright and socially responsible members of society.*

Ability Enhancement Compulsory Course (AECC): *Ability Enhancement Compulsory Course is designed to enhance students' knowledge and skills; examples include Communicative English and Environmental Science. These courses are obligatory for all disciplines.*

AE-1: Communicative English: This three-credit mandatory course, offered by the Department of English during the first semester of the degree programme, is conducted outside regular class hours.

AE-2: Environmental Science: This one-credit compulsory course, offered during the second semester by the Department of Human Excellence, emphasizes environmental awareness and stewardship.

Allied Optional (AO): *Allied optional course are elective modules that complement the primary disciplines by providing additional knowledge and skills. These courses allow students to explore areas of interest outside their major field of study, broadening their understanding and enhancing their skill set.*

Discipline Specific Elective (DSE): *These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature. Four courses are offered, two courses each in semester V and VI*

Note: To offer one DSE, a minimum of two courses of equal importance/weightage is a must. A department with two sections must offer two courses to the students.

Open Elective (OE): *A course chosen from a different discipline or subject area, typically to gain exposure. Students pursuing specific disciplines must select Open Elective courses from the options available across departments as per the college's course offerings. The breadth of Open Elective (OE) Courses is directly linked to the diversity of disciplines offered by the college. Two OE Courses are available, one in each semester V and VI, and are open to students from other departments.*

Self-Learning (SL): *A two-credit course designed to foster students' ability for independent and self-directed learning. There are* Four Self-Learning Courses:

- *Compulsory MOOC on NPTEL-SWAYAM in Semester I or II*
- 'Artificial Intelligence' *as a Self-Learning Course jointly offered by the Departments of CS, AI, IT and Data Science on JosTEL in Semester III*
- *A Department-Specific Self-Learning Course in Semester IV on JosTEL*
- *A Certificate Course in Semester V: Each department will offer ONE certificate Course (45 – 60 hours) that will be creditised in the curriculum.*

Internship (IS): *Following the fourth semester, students are required to undertake an internship during the summer break. Subsequently, they must submit a comprehensive report detailing their internship experience along with requisite documentation. Additionally, students are expected to participate in a viva-voce examination during the fifth semester. Credits for the internship will be reflected in the mark statement for the fifth semester. One of the Core Courses in Sem IV is offered as internship embedded course which contains content related to industry.*

Experiential Learning (EL): *In the sixth semester, students are required to undertake a one credit Project / Industrial visit / Field visit chosen by the department. This component is intended to foster learning by direct experience and application of acquired knowledge to practical settings.*

Comprehensive Examination (CE): *A detailed syllabus consisting of five units to be chosen from the courses offered over the five semesters which are of immense importance and those portions which could not be accommodated in the regular syllabus.*

Extra Credit Courses: *To support students in acquiring knowledge and skills through online platforms such as Massive Open Online Courses (MOOCs), additional credits are granted upon verification of course completion. These extra credits can be availed across five semesters (2 - 6). In line with UGC guidelines, students are encouraged to enhance their learning by enrolling in MOOCs offered by portals like SWAYAM, NPTEL, and others. Additionally, certificate courses provided by the college also qualify for these extra credits.*

Outreach Programme (OR): *It is a compulsory course to create a sense of social concern among all the students and to inspire them to dedicated service to the needy.*

Course Coding

The following code system (11 alphanumeric characters) is adopted for Under Graduate courses:

25	**UXX**	**0**	**0**	**XX**	**00/X**
Year of Revision	UG Department Code	Semester Number	Part Specification	Course Specific Initials	Running Number/with Choice

Course Specific Initials

GL - Languages (Tamil / Hindi / French / Sanskrit)
GE - General English
CC - Core Theory; CP- Core Practical
AC - Allied Course
AP - Allied Practical
SEC - Skill Enhancement Course
VE - Value Education
WS - Workshop
AE - Ability Enhancement Course
AO - Allied Optional
OP - Allied Optional Practical
ES - Discipline Specific Elective
IS - Internship
SL - Self-Learning
OE - Open Elective
PW - Project and Viva Voce
CE - Comprehensive Examination
EL - Experiential Learning
OR - Outreach Programme

EVALUATION PATTERN (UG)

Continuous Internal Assessment

Sl No	Component	Marks Allotted
1	Mid Semester Test	30
2	End Semester Test	30
3	*Two Components (15 + 20)	35
4	Library Referencing	5
	Total	**100**

Passing minimum: 40 marks

* *The first component is a compulsory online test (JosTEL platform) for 15 marks comprising 7 questions (1 mark) at K1 level and 4 questions (2 marks) at K2 level;* The second component is decided by the course in-charge in accordance with the prescribed K levels.

Question Paper Blueprint for Mid and End Semester Tests

Duration: 2 Hours								**Maximum Marks: 60**
Section		**K levels**						**Marks**
		K1	**K2**	**K3**	**K4**	**K5**	**K6**	
A *(compulsory)*		7						7 × 1 = 7
B *(compulsory)*			5					5 × 3 = 15
C *(either…or type)*				3				3 × 6 = 18
D *(2 out of 3)*	Mid Sem				1(2)	1*		2 × 10 = 20
	End Sem				1*	1(2)		
							Total	**60**

***** *Compulsory*

Question Paper Blueprint for Semester Examination

Duration: 3 Hours						**Maximum Marks: 100**
Section	**K levels**					**Marks**
	K1	**K2**	**K3**	**K4**	**K5**	**K6**	
A *(compulsory)*	10						10 × 1 = 10
B *(compulsory)*		10					10 × 3 = 30
C *(either…or type)*			5				5 × 6 = 30
D *(3 out of 5)*				2(3)	1(2)		3 × 10 = 30
						Total	**100**

***** *Compulsory*

Evaluation Pattern for Part IV and One/Two-credit Courses

Title of the Course	CIA	Semester Examination	Final
• One credit Core Course (Sem 1) • Skill Enhancement Course (NCC and Department Specific)	25 + 25 = 50	50 *(Department)*	100
• Self - Learning Course (Dept Specific) • Comprehensive Examination	25 + 25 = 50	50 *(CoE)*	100
• Value Education • Environmental Studies	50	50 *(CoE)*	100
• Skill Enhancement Course: Soft Skills • Self - Learning Course (Common) • Self - Learning Online Course (NPTEL / SWAYAM) • Certificate Course • Internship	100	-	100
• Project / Industrial Visit / Field Visit	100	-	100

Grading System

The marks obtained in the CIA and semester for each course will be graded as per the scheme provided in Table - 1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$$SGPA\ and\ CGPA = \frac{\sum_{i=1}^{n} C_i Gp_i}{\sum_{i=1}^{n} C_i}$$

$$WAM = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

Where,

Ci - credit earned for the Course i

Gpi - Grade Point obtained for the Course i

Mi - Marks obtained for the Course i

*n - Number of Courses **passed** in that semester*

WAM - Weighted Average Marks

Classification of Final Results

- For each of the first three parts in the UG Programme, there shall be separate classification on the basis of CGPA, as indicated in Table - 2.
- For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts / Science / Commerce / Management as Outstanding / Excellent / Very Good / Good / Above Average / Average, the marks and the corresponding CGPA earned by the candidate in Part III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in all the five Parts of the programme.
- Grade in Part IV and Part V shall be shown separately and it shall not be taken into account for classification.

- A pass in SHEPHERD will continue to be mandatory although the marks will not be counted for the calculation of the CGPA.
- Absence from an examination shall not be considered as an attempt.

Table - 1: Grading of the Courses

Mark Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
40 and above and below 50	5	C
Below 40	0	RA

Table - 2: Grading of the Final Performance

CGPA	Grade	Performance
9.00 and above	O	Outstanding*
8.00 to 8.99	A+	Excellent*
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re-appear

**The Candidates who have passed in the first appearance and within the prescribed duration of the UG programme are eligible. If the Candidates Grade is O/A+ with more than one attempt, the performance is considered "Very Good".*

Vision

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

Mission

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.
- Nurturing comprehensive learning and best practices through innovative and value- driven pedagogy.
- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

Programme Educational Objectives (PEOs)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

Programme Outcomes (POs)

1. Graduates will be able to comprehend the concepts learnt and apply in real life situations with analytical skills.
2. Graduates with acquired skills and enhanced knowledge will be employable/ become entrepreneurs or will pursue higher Education.
3. Graduates with acquired knowledge of modern tools communicative skills and will be able to contribute effectively as team members.
4. Graduates are able to read the signs of the time analyze and provide practical solutions.
5. Graduates imbibed with ethical values and social concern will be able to understand and appreciate social harmony, cultural diversity ensure sustainable environment.

Programme Specific Outcomes (PSOs)

1. Graduates will be able to understand the concepts in chemistry and apply in real life situations with analytical proficiency.
2. Graduates with acquired practical skills and enhanced theoretical knowledge will be employable or entrepreneurs or will pursue higher education.
3. Graduates with acquired knowledge of advanced tools in chemistry and communicative skills will be able to contribute effectively as team members.
4. Graduates will be able to recognize, analyze, and provide practical solutions to ever demanding chemistry based issues.
5. Graduates inculcated with ethical, scientific social responsibility will be able to create sustainable chemical alternatives to the contemporary environmental challenges.

B.Sc. Chemistry					
Programme Structure					
Part	**Semester**	**Specification**	**No. of Courses**	**Hours**	**Credits**
1	1- 4	Languages (Tamil / Hindi / French / Sanskrit)	4	16	12
2	1 - 4	General English	4	20	12
3	1 - 6	Core Course	11	48	39
	1 - 6	Core Practical	6	34	16
	1 & 2	Allied Course	2	12	8
	1 & 2	Allied Practical	-	-	-
	3 & 4	Allied Optional	2	8	6
	3 & 4	Allied Optional Practical	2	4	2
	5 & 6	Discipline Specific Elective	4	16	12
	5	Internship	1	-	1
	6	Project / Industrial Visit / Field Visit	1	-	1
	6	Comprehensive Examination	1	-	2
4	1 - 4	Value Education	4	8	4
	1 & 2	Ability Enhancement Compulsory Course	2	2	3
	2 - 5	Self - Learning	4	-	8
	3 & 4	Skill Enhancement Course	2	4	2
	5 & 6	Open Elective	2	8	4
5	2 - 6	Outreach Programme (SHEPHERD)	-	-	4
	2 - 6	Co-curricular and Extracurricular Activities	-	-	1
	2 - 6	Extra Credit Courses (MOOC) / Certificate Courses	5	-	(15)
		Total	**57**	**180**	**137 (15)**

B.Sc. CHEMISTRY PROGRAMME PATTERN									
		Course Details					Scheme of Exams		
Sem.	**Part**	**Course Code**	**Course Type**	**Title of the Course**	**Hours**	**Credits**	**CIA**	**SE**	**Final**
1	I	25UTA11GL01	**GL**	General Tamil – 1	4	3	100	100	100
		25UFR11GL01		Language French – 1					
		25UHI11GL01		Language Hindi – 1					
		25USA11GL01		Language Sanskrit – 1					
	II	25UEN12GE01A	**GE**	**General English – 1:** Pre-Intermediate Stream	5	3	100	100	100
		25UEN12GE01B		**General English – 1:** Intermediate Stream					
	III	25UCH13CC01	**CC Major**	**Core Course - 1:** General Chemistry - 1	5	5	100	100	100
		25UCH13CC02		**Core Course - 2:** Foundations of Chemistry	2	1	100	-	100
		25UCH13CP01		**Core Practical - 1:** Volumetric Analysis	6	3	100	100	100
		25UCH13AC01	**AC Minor**	**Allied Course - 1:** Mathematics for Chemistry - 1	6	4	100	100	100
	IV	25UHE14VE01	**VE**	**Value Education – 1:** Essentials of Humanity*	2	1	50	50	50
		25UEN14AE01	**AECC**	Communicative English	-	2	100	-	100
				Total	**30**	**22**			
2	I	25UTA21GL02	**GL**	General Tamil – 2	4	3	100	100	100
		25UFR21GL02		Language French – 2					
		25UHI21GL02		Language Hindi – 2					
		25USA21GL02		Language Sanskrit – 2					
	II	25UEN22GE02A	**GE**	**General English – 2:** Pre-Intermediate Stream	5	3	100	100	100
		25UEN22GE02B		**General English – 2:** Intermediate Stream					
	III	25UCH 23CC03	**CC Major**	**Core Course - 3:** General Chemistry - 2	5	5	100	100	100
		25UCH 23CP02		**Core Practical - 2:** Inorganic Qualitative Analysis	6	3	100	100	100
		25UCH 23AC02	**AC Minor**	**Allied Course - 2:** Mathematics for Chemistry - 2	6	4	100	100	100
	IV	25UHE 24AE02	**AECC**	Environmental Studies*	2	1	50	50	50
		25UHE 24VE02	**VE**	**Value Education - 2:** Fundamentals of Human Rights *	2	1	50	50	50
		25UCH24SL01	**SL**	Online Courses: (NPTEL/SWAYAM)	0	2	-	100	100
				Extra Credit Course	0	(3)			
				Total	**30**	**22 (3)**			
3	I	25UTA31GL03	**GL**	General Tamil – 3	4	3	100	100	100
		25UFR31GL03		Language French– 3					
		25UHI31GL03		Language Hindi– 3					
		25USA31GL03		Language Sanskrit – 3					
	II	25UEN32GE03B	**GE**	General English – 3: English for Science - 1	5	3	100	100	100
	III	25UCH33CC04	**CC Major**	**Core Course - 4:** General Chemistry- 3	4	3	100	100	100
		25UCH33CC05		**Core Course - 5:** General Chemistry - 4	4	3	100	100	100
		25UCH33CP03		**Core Practical - 3:** Physical Chemistry Practical - 1	3	2	100	100	100
		25UCH33AO01A	**AO Minor**	**Allied Optional - 1:** Physics - 1	4	3	100	100	100
		@		**Allied Optional Practical:** Physics	2	-	-	-	-
		25UCH33AO01B		**Allied Optional - 1:** Principles of Electronics	4	3	100	100	100
		@		**Allied Optional Practical:** Electronics	2	-	-	-	-
	IV	25UHE34VE03A	**VE**	**Value Education – 3:** Social Ethics – 1*	2	1	50	50	50
		25UHE34VE03B		**Value Education – 3:** Religious Doctrine – 1*					
		25UNC34SE01 / 25USS34SE01	**SEC**	**Skill Enhancement Course – 1:** Introduction to NCC / **Skill Enhancement Course – 1:** Soft Skills	2	1	100	-	100
		25UAI34SL02	**SL**	Artificial Intelligence (Online)	0	2	100	-	100
				Extra Credit Course	0	(3)			
				Total	**30**	**21 (3)**			
4	I	25UTA41GL04B	**GL**	General Tamil – 4: அறிவியல் தமிழ் (Scientific Tamil)	4	3	100	100	100
		25UFR41GL04		Language French– 4					
		25UHI41GL04		Language Hindi– 4					
		25USA41GL04		Language Sanskrit – 4					
	II	25UEN42GE04B	**GE**	General English – 4: English for Science - 2	5	3	100	100	100
	III	25UCH43CC06	**CC Major**	**Core Course - 6:** General Chemistry - 5	4	3	100	100	100
		25UCH43CC07		**Core Course - 7:** General Chemistry - 6	4	3	100	100	100
		25UCH43CP04		**Core Practical - 4:** Physical Chemistry Practical - 2	3	2	100	100	100
		25UCH43AO02A	**AO Minor**	**Allied Optional - 2:** Physics - 2	4	3	100	100	100
		25UCH43OP01A		**Allied Optional Practical:** Physics	2	2	100	100	100
		25UCH43AO02B		**Allied Optional - 2:** Communications Electronics	4	3	100	100	100
		25UCH43OP01B		**Allied Optional Practical:** Electronics	2	2	100	100	100

	IV	25UHE44VE04A 25UHE44VE04B	**VE**	**Value Education – 4:** Social Ethics – 2* **Value Education – 4:** Religious Doctrine – 2*	2	1	50	50	50
		25UNC44SE02 / 25UCH44SE02	**SEC**	**Skill Enhancement Course – 2:** NCC (Special Subject) / **Skill Enhancement Course – 2:** Current Trends in Industrial Chemistry (Internship Embedded Course)	2	1	100	-	100
		25UCH44SL03	**SL**	**Self Learning:** Essentials of Chemistry*	0	2	50	50	50
				Extra Credit Course	0	(3)			
				Total	**30**	**23 (3)**			
5	III	25UCH53CC08	**CC Major**	**Core Course - 8:** Inorganic Chemistry - 1	5	4	100	100	100
		25UCH53CC09		**Core Course - 9:** Organic Chemistry - 1	5	4	100	100	100
		25UCH53CP05		**Core Practical - 5:** Organic Analysis and Determination of Physical Constants	8	3	100	100	100
		25UCH53ES01A	**DSE**	**Discipline Specific Elective – 1:** Physical Chemistry - 1	4	3	100	100	100
		25UCH53ES01B		**Discipline Specific Elective – 1:** Spectroscopy and Electrochemistry					
		25UCH53ES02A	**DSE**	**Discipline Specific Elective – 2:** Bioorganic Chemistry	4	3	100	100	100
		25UCH53ES02B		**Discipline Specific Elective – 2**: Pharmaceutical Chemistry					
		25UCH53IS01	**IS**	Internship	0	1	100	-	100
	IV	25UCH54OE01	**OE**	**Open Elective - 1 (WS):** Everyday Chemistry	4	2	100	100	100
		25UCH54SL04	**SL**	**Certificate Course:** Basics of Instrumental Methods	0	2	100	-	100
				Extra Credit Course	0	(3)			
				Total	**30**	**22 (3)**			
6	III	25UCH63CC10	**CC Major**	**Core Course - 10:** Inorganic Chemistry – 2	5	4	100	100	100
		25UCH63CC11		**Core Course - 11:** Physical Chemistry - 2	5	4	100	100	100
		25UCH63CP06		**Core Practical - 6:** Gravimetric Analysis and Preparation of Organic Compounds	8	3	100	100	100
		25UCH63ES03A	**DSE**	**Discipline Specific Elective – 3:** Organic Chemistry – 2	4	3	100	100	100
		25UCH63ES03B		**Discipline Specific Elective – 3:** Health Science					
		25UCH63ES04A	**DSE**	**Discipline Specific Elective – 4:** Current Trends in Chemistry – 1	4	3	100	100	100
		25UCH63ES04B		**Discipline Specific Elective – 4:** Current Trends in Chemistry - 2					
		25UCH63EL01A 25UCH63EL01B 25UCH63EL01C	**EL**	Project / Industrial Visit / **Field Visit**	0	1	100	-	100
		25UCH63CE01	**CE**	Comprehensive Examination*	0	2	50	50	50
	IV	25UCH64OE02	**OE**	**Open Elective – 2:** Food & Nutrition	4	2	100	100	100
				Extra Credit Course	0	(3)			
				Total	**30**	**22 (3)**			
	V	25UCW65OR01	**OR**	Outreach Programme	-	4			
		25UCW65EC01	**EC**	Co - Curricular & Extra Curricular Activities	-	1			
1-6				**TOTAL**	**180**	**137 (15)**			

***For Grade Calculation:** Marks obtained out of 50 will be converted into 100 in the mark statements.

Open Elective - 1 (WS): 5th Semester

School	Course Code	Title of the Course
SPS		
Chemistry	25UCH54OE01	Everyday Chemistry
Electronics	25UEL54OE01A	Lab Equipment maintenance and Servicing
	25UEL54OE01B	PC Assembling and Servicing
Physics	25UPH54OE01A	Physics for Everyday life
	25UPH54OE01B	Renewable Energy Physics

Open Elective - 2: 6th Semester
Offered to students from other Departments

Department	Course Code	Title of the Course
Artificial Intelligence and Machine Learning	25UAI64OE02	Gen AI tools
Botany	25UBO64OE02	Landscape Designing and Waste Management
Biotechnology	25UBT64OE02	Food Science and Technology
BBA	25UBU64OE02A	Practical Stock trading
	25UBU64OE02B	Export Management
B Com Business Analytics	25UCB64OE02	Personal Investment Planning
B Com Computer Application	25UCC64OE02A	Social Media Marketing
	25UCC64OE02B	Basics of Banking
B Com Strategic Finance	25UCF64OE02	Personal Financial Management
Chemistry	25UCH64OE02	Food & Nutrition
B Com	25UCO64OE02A	Digital Marketing
	25UCO64OE02B	Digital Banking
	25UCO64OE02C	Stock Trading
Computer Science	25UCS64OE02	Design Thinking
BCA	25UBC64OE02	Web Design
Economics	25UEC64OE02	Economics for Competitive Exams
Electronics	25UEL64OE02A	CCTV and Smart Security Systems
	25UEL64OE02B	Entrepreneurial Electronics
English	25UEN64OE02	English for Employability
History	25UHS64OE02	Intellectual Revivalism in Tamil Nadu
Mathematics	25UMA64OE02	Mathematics for Competitive Examinations
Physics	25UPH64OE02A	Laser Technology and its Application
	25UPH64OE02B	Physics of Earth
Statistics	25UST64OE02	Applied Statistics
Tamil	25UTA64OE02	படைப்பிலக்கியம் (Creative writing)
Visual Communication	25UVC64OE02	Digital Media and Production

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UTA11GL01	பொதுத்தமிழ் – 1: General Tamil - 1	4	3

கற்றலின் நோக்கங்கள் (Course Objectives)
புதிய இலக்கிய வடிவங்களை அறியும் திறனைப் பெறுதல்
எழுத்து சொல் இலக்கணத்தில் இன்றியமையாமையை உணர்தல்
புதுக்கவிதைகளின் கூறுகளை வாழ்வியலோடு பொருத்திப்பார்த்தல்
தமிழ்க்கவிதைகளைப் பிறமொழிக் கவிதைகளோடு ஒப்பிட்டுப் பார்த்தல்
புதுக்கவிதைகளைப் படைக்கும் திறன் பெறுதல்

அலகு-1 **(12 மணி நேரம்)**

பாரதியார் கவிதைகள் - பாஞ்சாலிசபதம்: சபதச் சருக்கம்
பாரதிதாசன் கவிதைகள் - புரட்சிக்கவி : மன்னனின் சர்வாதிகாரம், கவிஞனின் எழுச்சியுரை, கவிஞனின் மொழிப்பற்று, மக்களாட்சி மலரும் விதம்
இலக்கிய வரலாறு - இருபதாம் நூற்றாண்டுத் தமிழ்க்கவிஞர்கள்
உரைநடை - முதல் மூன்று கட்டுரைகள்

அலகு-2 **(12 மணி நேரம்)**

வெ.இராமலிங்கனார் - தமிழ், அரசியல்
முடியரசனார் - தொழிலாளி, துறைதோறும் தமிழே காண்பீர், மொழியுணர்ச்சி
பெருஞ்சித்திரனார் - என்னென்று சொல்வோம், இனியேனும் ஒன்றிணைவீர்
பட்டுக்கோட்டையார் - என் விருப்பம், ஏட்டில் படித்ததோடு இருந்து விடாதே, அன்னசத்திரம் இருப்பதெதனாலே?
இலக்கிய வரலாறு - புதுக்கவிதை வடிவங்கள்
இலக்கணம் - எழுத்து

அலகு-3 : சமூகக் கவிதைகள் **(12 மணி நேரம்)**

சுரதா - நெஞ்சில் நிறுத்துங்கள், பூம்புகார்
மு. மேத்தா - உன்னுடைய கொடியை
கண்ணதாசன் - ஆணவம் அழியும்
அப்துல் ரகுமான் - பசி
தங்கம் மூர்த்தி - கூடு திரும்புதல் எளிதன்று
ஜெயபாஸ்கரன் - ஒற்றைக் கேள்வியுடன் ஒருவர்
இலக்கிய வரலாறு - சிறுகதை- உரைநடை
சிறுகதை - முதல் மூன்று கதைகள்

அலகு-4 : அரசியல் கவிதைகள் **(12 மணி நேரம்)**

ஈரோடு தமிழன்பன் - எட்டாவது சீர்
யுகபாரதி - பழைய புத்தக வியாபாரி
கனிமொழி - கருவறை வாசனை
அ.வெண்ணிலா - நீரில் அலையும் முகம்
பெருமாள் முருகன் - குழந்தைகளைத் தண்டித்தல்
சீனு ராமசாமி - அகதி
கல்கி சுப்பிரமணியம் - விதியை எழுதினேன்
இலக்கணம் - சொல்

அலகு-5 : அயலகக் கவிதைகள் **(12 மணி நேரம்)**

தஸ்லீமா நஸ்ரின் - கல் உடைக்கும் பெண்
மாயா ஏஞ்சலு - கைத்தட்டுங்கள் கொண்டாடுங்கள்
நானிலு கவிதைகள் - 10 கவிதைகள்
உரைநடை - நான்கு முதல் ஆறு வரை உள்ள கட்டுரைகள்
சிறுகதை - நான்கு முதல் ஆறு வரை உள்ள கதைகள்

கற்பித்தல் அணுகுமுறை Teaching Methodology	விரிவுரை **(Lecture),** காணொளிக் காட்சி **(Videos),** விளக்கக் காட்சி **(PPT presentation)**
மதிப்பீட்டு முறைகள் Assessment methods	நூல் நோக்குத் தேர்வு **(Open Book Test),** இயங்கலைத்தேர்வு **(**Online Test), ஒப்படைவு **(Assignment),** வினாடி வினா **(Quiz),** கருத்துரை **(Seminar)**

பாடநூல்:

பொதுத்தமிழ்-1(2025), தமிழாய்வுத்துறை, தூய வளனார் கல்லூரி

Websites and eLearning Sources:

- https://www.tamilvu.org/library/nationalized/pdf/35-subbureddiyar/452-panjalisabatham.pdf
- https://www.annacentenarylibrary.org - https://shorturl.at/KWZx5

- *https://eluthu.com/kavithai*
- *https://www.tamilvu.org/courses/degree/p103/p1032/html/p1032614.htm*
- *https://kavithaivaasal.blogspot.com/2017/11/blog-post.html*

Course Outcomes

CO No.	***CO-Statements*** **இப்பாடத்தின் நிறைவில் மாணவர்கள்**	***Cognitive Levels (K –Levels)***
CO–1	இக்கால இலக்கிய வகைகளைக் கண்டறிவர்	***K1***
CO–2	எழுத்து, சொல்லிலக்கணங்களின் அடிப்படைகளை வகைப்படுத்தி அறிவர்.	***K2***
CO–3	அயலகக் கவிதை வடிவங்கள் குறித்த தெளிவான விளக்கங்களைப் பெறுவர்.	***K3***
CO–4	மொழிபெயர்ப்புக் கவிதைகளைக் கற்பதன் வாயிலாகத் திறனாய்வு செய்யும் திறனை வளர்த்தெடுப்பர்.	***K4***
CO–5	புதுக்கவிதை வாயிலாக வெளிப்படும் சமூக, அரசியல் விழுமியங்களை மதிப்பிடுவர்	***K5***

Relationship Matrix											
Semester	***Course Code***			***Title of the Course***						***Hours***	***Credits***
1	***25UTA11GL01***			பொதுத்தமிழ் – *1: General Tamil - 1*						***4***	***3***
Course Outcomes↓	***Programme Outcomes (PO)***					***Programme Specific Outcomes (PSO)***					***Mean Scores of COs***
	PO-1	***PO-2***	***PO-3***	***PO-4***	***PO-5***	***PSO-1***	***PSO-2***	***PSO-3***	***PSO-4***	***PSO-5***	
CO-1	*3*	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*3*	*3*	*2.7*
CO-2	*2*	*2*	*3*	*2*	*2*	*3*	*2*	*3*	*2*	*3*	*2.4*
CO-3	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*2.8*
CO-4	*2*	*2*	*2*	*2*	*1*	*2*	*2*	*3*	*2*	*2*	*2.0*
CO-5	*3*	*2*	*3*	*2*	*2*	*3*	*2*	*2*	*3*	*3*	*2.5*
Mean Overall Score											***2.48 (High)***

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UFR11GL01	Language French – 1	4	3

Course Objectives
Familiarize students with the French language through an exploration of francophone culture, traditions, and civilization.
Build fundamental knowledge in listening, speaking, reading, and writing (LSRW) as outlined by the Common European Framework of Reference for Languages (CEFR).
Enable students to understand and use basic grammatical structures and essential vocabulary in context.
Equip students with the skills needed to engage in simple, real-life conversations and interactions in French.
Foster a deeper connection to the language by integrating cultural elements, enhancing motivation and intercultural awareness.

UNIT I **(12 Hours)**

1. Titre - Je Suis
2. Lexique - L'alphabet, les salutations, les loisirs, les nombres
3. Grammaire - Les pronoms personnels sujets, les articles définis et indéfinis, les verbes auxiliaires, les adjectifs de nationalité, l'adjectif interrogatif 'quel'
4. Production orale- se présenter
5. Production écrite - Donner des informations personnelles

UNIT II **(12 Hours)**

6. Titre - Près de moi
7. Lexique – Les lieux, la famille, la situation familiale, les professions
8. Grammaire – les verbes en 'er'au présent, le masculin et le féminin des professions, les adjectifs possessifs
9. Production orale- Demander et dire le lieu d'habitation
10. Production écrite - Présenter et parler de sa famille

UNIT III **(12 Hours)**

11. Titre - Qu'est-ce qu'on mange ?
12. Lexique – les commerces, les commerçants, les aliments, les moyens de paiement
13. Grammaire – le singulier et le pluriel des noms, les prépositions de lieu, les verbes en 'ir'
14. Production orale- faire des courses alimentaires, demander et dire le prix
15. Production écrite - Donner une appréciation, commander au restaurant, créer un menu

UNIT IV **(12 Hours)**

16. Titre - C'est où
17. Lexique – la ville, les monuments, les transports
18. Grammaire – la fréquence, l'impératif, les connecteurs
19. Production orale- demander et indiquer le chemin, se déplacer des transports en commun
20. Production écrite - présenter une ville ou un quartier, créer un guide pour un monument

UNIT V **(12 Hours)**

21. Titre - C'est tendance
22. Lexique – les vêtements, les couleurs, les matières, les objets technologiques, la météo
23. Grammaire – le genre et le nombre des adjectifs, le futur proche, la place des adjectifs, l'adjectif démonstratif
24. Production orale- demander et dire l'utilité d'un produit, parler de la météo
25. Production écrite - Donner une appréciation sur un vêtement, décrire un objet
26. Indian knowledge system- Incorporating hand gestures and expressions to reinforce non-verbal communication in French and assimilating traditional Indian culinary knowledge while learning French food cultures (5%)

Teaching Methodology	Kinesthetic & Multi-Sensory Learning, Rhythm-Based Learning – ex.comptines, Deductive & Explicit Learning- structural approach, oral approach, blended learning, media integration
Assessment Methods	*Oral assessment:* Introduce Oneself – (Rubric –assessed on correct usage of vocabulary, personal pronouns and basic verbs) *TPR activity:* Evaluate comprehension of oral commands like action words. (Rubric –assessed on comprehension, response and reaction time) *Reading comprehension:* Read a simple passage like a personal description, and answer questions. (Rubric –assessed on accuracy of response) *Written assessment:* Write simple structured texts on short personal introduction. (Rubric –Graded on correct grammar, sentence structure, and vocabulary usage)

Books for Study:

1. Mensdorff-Pouilly, L., Opatski, S., Petitmengin, V., Pons, S., Sperandio, C., Djimli, H., & Veldeman-Abry, J. (2022). *Édito A1: Méthode de français* (2nd ed.). Didier FLE, Hatier. (P.1-P.86)

Books for Reference:

1. Dauda, P., Giachino, L., &Baracco, C. (2020). *Génération A1*. Didier.
2. Mérieux, R., &Loiseau, Y. (2012). *Latitudes A1*. Didier.

Websites and e-learning Sources:

1. https://apprendre.tv5monde.com/en
2. https://www.thefrenchexperiment.com
3. https://www.iletaitunehistoire.com
4. https://www.francaisfacile.com
5. https://www.francaisauthentique.com

	Course Outcomes	
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO1	Recognize and use fundamental vocabulary including greetings, while constructing simple sentences with personal pronouns and basic verbs.	**K1**
CO2	Introduce themselves, ask and answer questions about personal details, express preferences, and engage in role-play conversations related to daily life	**K2**
CO3	Differentiate between definite and indefinite articles, form plural and singular nouns, conjugate regular verbs in the present tense, and use adjectives correctly	**K3**
CO4	Ask for and give directions, order food, discuss weather conditions, describe clothing and objects, and create simple structured texts such as menus, guides, and personal descriptions.	**K4**
CO5	Demonstrate awareness of Francophone culture through language use in real-world scenarios, such as public transport, shopping, dining, and professional settings.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
1	**25UFR11GL01**			Language French – 1					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	1	3	2	1	1	2	3	1.9
CO2	3	2	3	3	1	3	2	3	3	3	2.6
CO3	2	2	2	2	2	2	1	2	2	2	1.9
CO4	3	3	3	3	2	3	2	2	2	3	2.6
CO5	3	2	2	3	3	3	3	2	3	3	2.7
Mean Overall Score											**2.34 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UHI11GL01	Language Hindi - 1	4	3

Course Objectives
To understand the basics of Hindi Language
To make the students to be familiar with the Hindi words
To enable the students to develop their effective communicative skills in Hindi
To introduce the socially relevant subjects in Modern Hindi Literature
To empower the students with globally employable soft skills

UNIT I **(12 Hours)**

1. Swar
2. Vyanjan
3. Barah Khadi
4. Shabd aur Vakya

UNIT II **(12 Hours)**

5. Rishtom ke Naam
6. Gharelu Padartho ke Naam
7. Sangya
8. Hindi Ginthi

UNIT III **(12 Hours)**

9. Sapthah ke Din
10. Sarvanam
11. Vilom Shabd
12. Dr. Abdul Kalam

UNIT IV **(12 Hours)**

13. Sal ke Maheene
14. Shareer ke Ang
15. Visheshan
16. Batcheeth - Dookan mein

UNIT V **(12 Hours)**

17. Janvarom ke Naam
18. Rang
19. Dishayem
20. Adhikal (Introduction)

Teaching Methodology	Peer Instruction Exercise, Videos, PPT, Quiz, Group Discussion
Assessment Methods	Seminar, Quiz, Assignment

Books for Study:

1. *Prathamic Patya Pusthak*, Dakshina Bharath Hindi Prachara Sabha, Thiagaraya Nagar, Chennai, 2022.
2. M. Ravi Chandran, *Concise Trilingual Dictionary,* Lotus Publications, Madurai, 2021.
3. M. kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020.
4. *Madyama Patya Pusthak*, Dakshina Bharath Hindi Prachara Sabha, Thiagaraya Nagar, Chennai, 2022.

Books for Reference:

1. Dr. A. P. J. Abdul Kalam, *Mere sapnom ka Bharath*, Prabath Prakashan, Noida, 2020,
2. *Meri Pratham Hindi Sulekh Shabd Gyaan*, Wonder House Books, Noida, 2022.
3. Aravind Kumar, *Sampoorna Hindi Vyakaran our Rachana*, Lucent publisher, 2022.
4. *Adhunik Hindi Vyakaran our Rachana,* Bharati Bhavan Publishers & distributors, 2024.
5. Acharya Ramchandra Shukla, *Hindi Sahitya Ka Itihas*, Prabhat Prakashan, 2023.

Websites and e-Learning Sources:

1. https://learningmole.com/hindi-alphabet-letters-pronunciation-guide/
2. https://www.careerpower.in/hindi-alphabet-varnamala.html
3. https://www.youtube.com/watch?v=b0UvXnIC8qc
4. https://www.importanceoflanguages.com/learn-hindi-language-guide/
5. https://parikshapoint.com/hindi-sahitya/

Course Outcomes		
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO1	Introduction to Hindi sounds.	**K1**
CO2	Acquisition of Hindi Vocabulary.	**K2**
CO3	Sentence formation in Hindi.	**K3**
CO4	Practical application of grammar.	**K4**
CO5	Justify the social & political conditions of Aadhi Kaal in Hindi Literature.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**				**Hours/week**			**Credits**
1	**25UHI11GL01**			Language Hindi - 1				**4**			**3**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scoreof Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	1	3	3	3	1	3	2	2.3
CO2	2	3	2	3	1	2	3	3	3	2	2.4
CO3	3	2	2	2	1	3	2	3	2	3	2.3
CO4	3	1	2	3	2	3	2	3	3	2	2.4
CO5	2	3	3	2	3	2	3	3	1	3	2.5
									Mean overall Score		**2.38 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	**25USA11GL01**	Language Sanskrit - 1	**4**	**3**

Course Objectives
To improve knowledge in Sanskrit
To train students in reading Sanskrit words
To introduce the fundamental grammar
To coach ethics and improve self-confident
To train the students to use the tenses in Sanskrit

UNIT I (**12 Hours)**

Introduction to Sanskrit

UNIT II (**12 Hours)**

Subhandha shabda vicaraha (akaara, aakaara, ikaara, iikaara)

UNIT III (**12 Hours)**

Vartamankala lat lakaara vakya prayogaha

UNIT IV (**12 Hours)**

Samskrita sharala vakya paricayaha

UNIT V (**12 Hours)**

Selected verses from good saying in Sanskrit

Teaching Methodology	Videos, PPT, Blackboard, Demonstration, Exercises
Assessment Methods	Seminar, Quiz, Group Discussion.

Books for Study:

Shadhamanjari

Books for Reference:

1. Kulapathy, K.M., Sarala Samkrit Balabodh, Bharatiya Vidya Bhavan, Munushimarg Mumbai – 4000 007 2021
2. R.S. Vadhyar & Sons, Book – Sellers and publishers, Kalpathi. Palagahat 678003, Kerala, South Inida, Shabdha Manjari 2022
3. Balasubramaniam R, Samskrita Akshatra Siksha, Vangals Publications, 14th Main road, JP Nagar, Bangalore – 78 2020

Websites and e-Learning Sources:

1. https://www.learnsanskrit.org/static/pdf/vyakarana.pdf
2. https://archive.org/details/in.ernet.dli.2015.382597
3. https://openpathshala.com/sanskrit-grammar-basic/3

Course Outcomes		
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO–1	Remember and Recall words relating to objects.	**K1**
CO–2	Understand classified vocabulary.	**K2**
CO–3	Apply nouns and verbs	**K3**
CO–4	Analyze different forms of names and verbs	**K4**
CO–5	Appreciate the good saying of Sanskrit Improve the self-values.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25USA11GL01**			Language Sanskrit - 1						**4**	**3**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PS02**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	1	1	3	2	3	2	3	2	2	2.2
CO-2	2	2	3	3	1	2	2	3	3	2	2.3
CO-3	3	2	2	2	2	2	2	3	3	2	2.3
CO-4	3	2	2	3	2	3	3	3	2	2	2.3
CO-5	3	2	3	2	3	2	2	3	3	3	2.6
Mean Overall Score											**2.34 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UEN12GE01A	**General English – 1:** Pre-Intermediate Stream	5	3

Course Objectives (CO)
To develop basic listening, speaking, reading, and writing skills
To improve comprehension and fluency in both oral and written communication
To learn language rules to create meaningful written and spoken communication
To learn and integrate new vocabulary to expand language proficiency
To construct grammatically correct sentences and engage in simple conversations

UNIT I: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening for familiar words in stories
	(Practice)	**:**	"The City Mouse and the Country Mouse"
Reading:	**(Skill)**	**:**	Reading aloud
	(Practice)	**:**	"The Peacock and the Crane" "The Curious Monkey"
Grammar:	**(Practice)**	**:**	Nouns: Types; Gender
Vocabulary:	**(Practice)**	**:**	Kinship terms
Speaking:	**(Skill)**	**:**	Repetition of Minimal Pairs
	(Practice)	**:**	Pronunciation of words
Writing:	**(Skill)**	**:**	Using capital letters correctly in names, the pronoun 'I,' days, months, languages, nationalities, sentence beginnings, and book titles
	(Practice)	**:**	Capitalisation

UNIT II: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening to identify phrases and sentences
	(Practice)	**:**	"How to Be Happy in Every Situation"
Reading:	**(Skill)**	**:**	Reading for main ideas
	(Practice)	**:**	"The World is a Mirror"
Grammar:	**(Practice)**	**:**	Countable and Uncountable Nouns; Singular and Plural Nouns; Pronouns
Vocabulary:	**(Practice)**	**:**	Human body vocabulary
Speaking:	**(Skill)**	**:**	Responding to basic questions
	(Practice)	**:**	Simple conversations
Writing:	**(Skill)**	**:**	Writing personal and academic information with correct spelling
	(Practice)	**:**	Using Correct Spelling in Writing

UNIT III: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening for main ideas
	(Practice)	**:**	"Magic Pot"
Reading:	**(Skill)**	**:**	Identifying the message of the story
	(Practice)	**:**	Zen story: "Carry On" Zen story: "Harmony"
Grammar:	**(Practice)**	**:**	Adjectives, Articles and Verbs
Vocabulary:	**(Practice)**		Vegetables and Fruits
Speaking:	**(Skill)**		Using 'be' verbs and adjectives to describe people, things and pictures
	(Practice)		Describing People, Things and Pictures
Writing:	**(Skill)**	**:**	Practising correct punctuation in writing
	(Practice)	**:**	Punctuation

UNIT IV: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening for the main ideas in the story and expressing one's views about them
	(Practice)	**:**	"A Glass of Milk"
Reading:	**(Skill)**	**:**	Understanding the central idea of the story and sharing personal views

	(Practice)	**:**	"Birbal: The Wise Man"
Grammar:	**(Practice)**	**:**	Simple Present Tense
Vocabulary:	**(Practice)**	**:**	Plants, Trees and Flowers
Speaking:	**(Skill)**	**:**	Describing daily routines using the simple present tense
	(Practice)	**:**	Describing one's own routine and a friend's routine
Writing:	**(Skill)**	**:**	**Writing simple sentences in response to questions and on a given topic**
	(Practice)	**:**	Writing Simple Sentences

UNIT V: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening to understand the sequence of ideas
	(Practice)	**:**	A Father and His Son
Reading:	**(Skill)**	**:**	Identifying the implicit idea of the story
	(Practice)	**:**	"The Stone Cutter"
Grammar:	**(Practice)**	**:**	Simple Past Tense
Vocabulary:	**(Practice)**	**:**	Birds, Animals and Insects
Speaking:	**(Skill)**	**:**	Narrating stories, events, or experiences using the simple past tense
	(Practice)	**:**	Narrating a Familiar Story or Past Events
Writing:	**(Skill)**	**:**	Writing a paragraph using a picture by answering questions or describing it.
	(Practice)	**:**	Picture Composition

Teaching Methodology	Lectures, task-based activities, audio-visual listening tasks, guided reading and writing exercises, discussions
Assessment Method	Listening and reading comprehension exercises, verbal presentations, role plays and conversations, writing tasks

Books for Study:
Seeds of English Skills by Dr. M. John Britto, Dr. B. Sam Jerome Sharone, and Dr. S. Sajeev.

	Course Outcomes	
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
CO-1	Recognize basic sounds, words, and simple ideas through listening practice.	**K1**
CO-2	Understand and engage in simple conversations, improving fluency in both oral and written communication.	**K2**
CO-3	Apply grammatical rules to construct meaningful sentences in spoken and written forms.	**K3**
CO-4	Integrate new vocabulary into everyday communication to expand language proficiency.	**K4**
CO-5	Construct grammatically correct sentences and engage in simple conversations, expressing personal experiences and opinions.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25UEN12GE01A**			**General English – 1:** Pre-Intermediate Stream						**5**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PS02**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	2	3	2	3	2	2	**2.4**
CO2	3	2	2	3	2	3	2	3	2	3	**2.5**
CO3	3	2	2	2	3	2	2	3	2	2	**2.3**
CO4	3	2	2	2	2	2	2	2	2	3	**2.2**
CO5	3	2	3	2	3	2	3	2	3	2	**2.5**
Mean Overall Score											**2.38 (High)**

Semester	Course Code	Title of the Course	Hours/ Week	Credits
1	25UEN12GE01B	**General English – 1:** Intermediate Stream	5	3

Course Objectives
To improve students' ability to listen, speak, read, and write in English through interactive and meaningful activities tailored to real-life contexts.
To enable students to use appropriate vocabulary, grammar, and pronunciation to introduce themselves, express opinions, describe people and places, and engage in conversations.
To equip students with reading strategies to comprehend texts, and apply structured writing methods to express ideas coherently.
To develop students' ability to use common grammar structures accurately and expand their vocabulary through word formation techniques.
To help students apply effective learning strategies to enhance their academic and professional success.

Unit 1: What's in a Name? (15 Hours)

1. Listening:	**(Skill)**	Listening for gist
	(Practice)	"Not Good with Names" by Cynthia Win (a TED talk)
2. Reading:	**(Skill)**	Skimming
	(Practice)	"Eli, the Equation"
3. Grammar:	**(Practice)**	Nouns
4. Vocabulary:	**(Practice)**	Forming compound nouns
5. Study Skill:		Using online dictionaries
6. Speaking:	**(Skill)**	Initiating conversations (Greeting – Starting a conversation with new people – Introducing and answering an introduction)
	(Practice)	Introducing oneself and others in conversations
7. Writing:	**(Skill)**	Narrating a personal anecdote – Using capitals and end mark punctuations in sentences
	(Practice)	Guided Composition: The story of my name

Unit 2: Family is Forever! (15 Hours)

1. Listening:	**(Skill)**	Predicting topics
	(Practice)	"Tracing Roots, Telling Stories"
2. Reading:	**(Skill)**	Scanning
	(Practice)	"Home Lost, Family Found"
3. Grammar:	**(Practice)**	Pronouns
4. Vocabulary:	**(Practice)**	Words related to family and relationships
5. Study Skill:		Recognising your learning style
6. Speaking:	**(Skill)**	Talking about your family (family members and relationships, their personalities and your attachment, family routines, and challenges)
	(Practice)	Talking about your family (in conversations)
7. Writing:	**(Skill)**	Narrating events in chronological order – Using punctuations in numbers
	(Practice)	Controlled Composition: My family history

Unit 3: Nothing is Better than a Good Friend (15 Hours)

1. Listening:	**(Skill)**	Listening for main idea
	(Practice)	"Nothing is better than a good friend"
2. Reading:	**(Skill)**	Predicting
	(Practice)	(Jigsaw reading) Fables about friends: (a) "The Hare with Many Friends" – (b) "The Two Fellows and the Bear" – (c) "The Fox and the Stork" – (d) "The Four Friends and a Hunter"
3. Grammar:	**(Practice)**	Adjectives
4. Vocabulary:	**(Practice)**	Forming nouns, adjectives, verbs and adverbs using suffixes
5. Study skill:		Setting and prioritising language learning goals
6. Speaking:	**(Skill)**	Talking about people (Describing people's appearance and their mannerism – Giving your opinion about people – Expressing what you like and dislike in a person)

	(Practice)	Delivering a short talk about one's best friend
7. Writing:	**(Skill)**	Describing people (What they wear, how they move and seem to feel, and where they are) Using comma in sentences.
	(Practice)	Controlled composition: Describing people in given pictures

Unit 4: The Inner Me **(15 Hours)**

1. Listening:	**(Skill)**	Listening to understand pronunciation
	(Practice)	"The bare necessities" from *The Jungle Book*
2. Reading:	**(Skill)**	Previewing a text
	(Practice)	"The Surprising Benefits of Being an Introvert"
3. Grammar:	**(Practice)**	Articles and Quantifiers
4. Vocabulary:	**(Practice)**	Forming words with different meanings using prefixes
5. Study skill:		Planning a study schedule
6. Speaking:	**(Skill)**	Asking about feelings – Expressing one's feelings
	(Practice)	Talking about feelings in different situations
7. Writing:	**(Skill)**	Describing character traits (Writing about what characters would say or do) Using quotation marks and apostrophes in sentences
	(Practice)	Controlled Composition: Cruel Cinderella

Unit 5: Hometown Appetite **(15 Hours)**

1. Listening:	**(Skill)**	Listening for supporting details
	(Practice)	"The Village that Raised Me"
2. Reading:	**(Skill)**	Questioning circles for active reading
	(Practice)	"Homecoming"
3. Grammar:	**(Practice)**	Prepositions of time, place and movement
4. Vocabulary:	**(Practice)**	Changing words from one class to another
5. Study skill:		Tracking progress in learning
6. Speaking:	**(Skill)**	Describing a place
	(Practice)	Talking about your hometown
7. Writing:	**(Skill)**	Describing objects – Using colon in sentences
	(Practice)	Controlled Composition: Writing posts for social media, describing your college campus and classroom

Teaching Methodology	Lectures, Demonstrations, Discussions, Peer-Review Tasks, Role-plays, Pair and group activities
Assessment Tools	Listening and reading comprehension tasks, Individual talks, Role plays, Controlled and guided compositions

Books for Study:

M.S. Xavier Pradheep Singh, J. Amalaveenus, and A. Napoleon. *English and Me* by Viva Books, 2025.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify and recall common grammar structures, vocabulary, and pronunciation patterns used in everyday communication.	**K1**
CO2	Demonstrate comprehension of spoken and written texts by summarising key ideas, identifying main points, and making inferences.	**K2**
CO3	Use appropriate vocabulary, grammar, and pronunciation to introduce themselves, express opinions, describe people and places, and engage in meaningful conversations.	**K3**
CO4	Differentiate between various reading and writing strategies, such as skimming, scanning, and structured writing, to effectively interpret and construct texts.	**K4**
CO5	Critically review written and spoken texts for clarity, coherence, and correctness, providing constructive feedback for improvement.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
1	**25UEN12GE01B**		**General English – 1:** Intermediate Stream						**5**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2.5	3	3	2.5	3	3	2.5	2.5	3	2.8
CO2	2.5	3	2.5	2.5	2.5	3	3	2.5	2.5	3	2.7
CO3	3	2.5	2.5	3	3	2.5	2.5	2.5	3	2.5	2.7
CO4	2.5	2.5	2.5	3	2.5	2.5	2.5	3	2.5	2.5	2.6
CO5	3	2.5	2.5	2.5	3	2.5	2.5	2.5	3	2.5	2.65
Mean Overall Score											**2.69 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UCH13CC01	**Core Course - 1:** General Chemistry - 1	5	5

Course Objectives
To understand the properties of periodic table
To know the properties of different hydrides and the concepts of acids and bases
To find out the basic ideas involved in bonding
To acquire knowledge about reagents and intermediates involved in organic chemistry
To learn basic concepts in quantum chemistry

UNIT I: Periodicity and Periodic Properties (15 Hours)

Refinements of the Bohr theory – the four quantum numbers - Pauli exclusion principle - Build-up of the elements, Hund's rule. Sequence of energy levels – the Aufbau principle - Arrangement of the elements in the periodic table-Groups and periods - Sizes of atoms and ions – atomic, ionic, covalent and metallic - Electronic configurations of elements of various groups

The concept of shielding and effective nuclear charge – Slater's rules - Ionization energies - Electron affinities - Electronegativity – Pauling, Mulliken and Alfred-Rochow - Metallic and non-metallic character - Variable valency and oxidation states.

UNIT II: Hydrogen and Hydrides (15 Hours)

Isotopes of hydrogen - *Ortho* and *para* hydrogen - Hydrides – ionic, covalent, metallic and intermediate hydrides - The hydrogen ion - Hydrogen bonding. Concepts of acids and bases –Bronsted-Lowry theory, Lewis theory, the solvent system concept, Lux-Flood definition and Usanovich definition – Hard and soft acids and bases

UNIT III: Electronic Structure and Bonding (15 Hours)

Structure of an atom, Lewis structures of molecules, Kekule structures, Condensed structures, Atomic orbitals, Introduction to molecular orbital theory, Hybridisation-sp^3 (methane and ethane), sp^2-ethene, sp-ethyne, Bond length, Bond strength and Bond angle, applications of dipole moment to simple organic molecules, Polar and non-polar molecules, . Different types of arrow notations used in organic chemistry, Types of organic reactions-addition, substitution, elimination and rearrangement.

UNIT IV: Organic Reagents, Intermediates, Acids and Bases (15 Hours)

Types of organic reagents-Electrophiles, Nucleophiles, Reaction intermediates-carbocation, carbanion, free radicals, carbenes and nitrenes-structure, hybridization, formation and reactions. Electronic effects-inductive effect, Resonance effect, mesomeric effect and hyper conjugative effect. An introduction of acid and base, pKa, pH, Organic acids and bases, Acidity of phenols, Basicity of amines.

UNIT V: Basic Quantum Chemistry (15 Hours)

Units, quantities and symbols- The SI /IUPAC nomenclature, physical quantities - derived units, different physico- chemical quantities with their symbols, definitions and units.

Quantum mechanics and atomic structure- wavelength and frequency, simple harmonic motion, plane wave, and stationary wave, Blackbody radiation, Einstein and the quantization of radiation, Bohr's atomic theory, Compton effect, uncertainty principle, de Broglie equation, Schrodinger wave equation, Eigen function, significance of ψ and ψ^2.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Lee, J. D. (1991). *Concise Inorganic Chemistry*, (4thEd.). ELBS William Heinemann.
2. Keith J. Laidler, John H. Meiser, (2006). *Physical Chemistry*, (2nd Ed.). CBS Publishers and Distributers.
3. Bruice, P. Y. (2007). Organic chemistry, (4th Ed.). Pearson Education, Inc.
4. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). Principles of Physical Chemistry (49th Ed.). Shoban Lal Nagin Chand & Co.
5. Prasad, R. K. (2022). *Quantum Chemistry* (5th Ed.). New Age International Publishers.

Books for Reference:

1. Atkins, P.W., & Paula, J. (2014). *Physical Chemistry*, (10thEd.). Oxford University Press.
2. Pine, S. H. (1986). *Organic Chemistry* (4thEd.). McGraw-Hill International Book Company.
3. Solomons, T. W. G. (1996). *Organic chemistry* (6thEd.). John Wiley and Sons.
4. Wade, L. G. (2003). *Organic chemistry* (5thEd.). Pearson Ltd.
5. Carey, F. A. (2000). *Organic chemistry* (4thEd.). McGraw-Hill International Book Company.
6. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry*, (5th Ed.). Pearson Education.
7. Cotton, F. A., Wilkinson, G., & Gauss, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John Willey and Sons. Inc.
8. Castellan, G. W. (2004). *Physical chemistry* (4thEd.). Narosa.

Websites and eLearning Sources:

1. https://www.nios.ac.in/media/documents/SrSec313NEW/313_Chemistry_Eng/313_Chemistry_Eng_Lesson3.pdf
2. https://images.topperlearning.com/topper/revisionnotes/3766_Topper_21_101_3_2_35_103_Hydrogen_and_Hydrides_up201606091140_1465452619_0778.pdf?v=0.0.1
3. https://ncert.nic.in/textbook/pdf/kech104.pdf
4. https://tech.chemistrydocs.com/Books/Organic/Organic-Chemistry-An-Acid-Base-Approach-3e-By-Michael-Smith.pdf
5. https://stjohnscollege.edu.in/web/wp-content/uploads/2022/01/0123567718-Fundamentals_of_Quantum.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Analyze the periodic properties and trends in the periodic table.	**K1**
CO2	Find out the electronic effects in various organic compounds	**K2**
CO3	Apply the acid base concepts to organic and inorganic compounds.	**K3**
CO4	Explain organic reactions on the basis of reagents, intermediates and reaction mechanisms	**K4**
CO5	Evaluate the basic radiation concepts, wave particle dualism, Bohr's atomic theory and Schrodinger wave equation	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25UCH13CC01**			**Core Course - 1:** General Chemistry - 1						**5**	**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	2	2	1	1	2	2	**2.0**
CO2	3	2	2	2	2	2	2	1	1	1	**1.8**
CO3	3	3	3	1	1	2	2	2	2	2	**2.1**
CO4	3	3	3	3	2	2	2	2	2	2	**2.4**
CO5	3	2	2	2	2	2	2	2	2	2	**2.1**
										Mean Overall Score	**2.1 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UCH13CC02	**Core Course - 2:** Foundations of Chemistry	2	1

Course Objectives
To understand the importance of modern periodic table
To handle the reagents and laboratory ware following the rules
To know the different concentration terms
To analyse different methods of volumetric techniques
To appreciate the Indian Knowledge System through metallurgy

UNIT I: Periodic Table (6 Hours)

Significance of the modern periodic table-(IYPT 2019)-uses of interactive periodic table (rsc.org/periodic-table)-format of the modern periodic table-grouping of elements as metals, nonmetals and metalloids. Atomic number-mass number-atomic weight-isotopes-writing electronic configuration of elements-valency-calculation of oxidation state of inorganic compounds.

UNIT II: Chemicals and Apparatus Using in Laboratory (6 Hours)

Selecting and handling reagents and other chemicals, classifying chemicals, reagent grade, primary standard grade and special purpose reagent grade. Rules for handling reagents and solutions, cleaning and making of laboratory ware. Measuring mass using electronic analytical balance. Desiccators and desiccants. Apparatus for precisely measuring volume pipette, burette and volumetric flask.

UNIT III: Concentration Terms (6 Hours)

Mole concept, Calculating amount of substances in moles, and molecular weight calculations, Molar volume, oxidation number, Concentration of solutions- molality, molarity, normality and mole fraction.

UNIT IV: Volumetric Analysis (6 Hours)

Principle of titrations-different types of titrations-acidimetry, alkalimetry, permanganometry and complexometry. Error analysis: Accuracy, precision, types of Errors.

UNIT V: Indigenous Knowledge in Metallurgy and Alloys Production (IKS) (6 Hours)

Introduction to Indian metallurgy: Overview of metallurgy in ancient India-Indigenous Iron, Copper, and Zinc Extraction Methods-Traditional Smelting and Casting Techniques-Role of Metallurgy in Ancient Indian Civilizations (Harappan, Mauryan, and Gupta periods)-Iron Pillar of Delhi: Corrosion Resistance Mechanism-Non-Ferrous Metallurgy in IKS.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Skoog, D. A., West, D. M., Holler, J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry*, (9th Ed.). Brooks/Cole-Cengage Learning, Belmont.
2. Morrison, R. T., & Boyd, R. N. (1987). *Organic Chemistry*, (4th Ed.). Prentice-Hall of India, Pvt, Ltd.
3. Bruice, P. Y. (2007). *Organic Chemistry*, (4th Ed.). Pearson Education, Inc.
4. Lee, J. D. (1991). *Concise Inorganic Chemistry*, (4th Ed.). ELBS William Heinemann.
5. Ghosh, T. A. (1989). *The Origin of Iron and Steel In India*. Gyan Publishing House.
6. Rao, D. K. N. (2007). *Traditional Indian Metallurgy: A Guide to Indian Ancient Iron and Steel Technologies*. ICSSR.

Books for Reference:

1. Maron, S. H., & Prutton, C. P. (1972). *Principles of Physical Chemistry*, (4th Ed.). The Macmillan Company.
2. Lee, J. D. (1991). *Concise Inorganic Chemistry*, (4th Ed). ELBS William Heinemann.
3. Raj, G. (2001). *Advanced Inorganic Chemistry* (26th Ed.). Goel Publishing House.
4. Huheey, J. E. (1993). *Inorganic Chemistry: Principles of Structure and Reactivity*, (4th Ed.). Addison-Wesley Publishing Company.

5. Vaidyanathan, C. S. S. (2002). *The Iron Pillar of Delhi: An Ancient Wonder*. Indian National Trust for Art and Cultural Heritage.
6. Vyas, R. S. (1994). *Indian Non-Ferrous Metallurgy*. I.K. International Publishing House.
7. Iyer, A. P. K. (2000). *Indigenous Knowledge Systems in India: Metallurgy and Material Culture*. Cambridge University Press.

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in
2. http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm
3. http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html
4. https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding
5. https://www.chemtube3d.com/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify the properties of elements in the periodic table	**K1**
CO2	Remember the basic concentration terms in volumetric analysis	**K2**
CO3	Recall the basics of laboratory operations	**K3**
CO4	Categorize different methods of volumetric techniques based on applications	**K4**
CO5	Apply the knowledge of extraction for other metal extraction process	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25UCH13CC02**			**Core Course - 2:** Foundations of Chemistry						**2**	**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	3	3	2	2	2	**2.1**
CO2	3	3	3	2	2	3	2	3	2	2	**2.3**
CO3	2	2	2	2	2	2	3	2	2	2	**2.5**
CO4	2	3	2	2	2	3	2	2	2	2	**2.2**
CO5	2	2	2	2	2	2	3	2	2	2	**2.1**
										Mean Overall Score	**2.66 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UCH13CP01	**Core Practical - 1:** Volumetric Analysis	6	3

Course Objectives
To understand laboratory safety protocols.
To develop skills in handling glassware in a chemistry laboratory.
To understand the fundamentals of quantitative inorganic compound estimation.
To analyze active ingredients in pharmaceutical formulations.
To familiarize with the concentration terms and relate calculations.

UNIT I: Handling of chemicals and glass wares (18 Hours)

Primary and Secondary standards, Cleaning and marking of laboratory ware, measuring mass, the electronic analytical balance, measuring volume, units of volume, the effect of temperature on volume measurements, calibrating volumetric glassware, safety in laboratory.

UNIT II: Terms used in volumetric analysis (18 Hours)

Standard solution, back-titration, equivalence points and end points, indicators, volumetric calculations, acid/base titrations, titration errors with acid/base indicators, the common acid/base indicators, titrating a strong acid with a strong base, complexation titrations, precipitation titrations, redox titrations, theory of indicators – calculations for strengths of solutions and the amount of substances in solution.

UNIT III: Preparation of solutions (18 Hours)

1. Weighing a sample in electronic balance.
2. Preparation of a standard solution.
3. Making up a given solution.
4. Filling and error free reading of buret/pipet.

UNIT IV: Acid–base and redox titrations (18 Hours)

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of oxalic acid by NaOH using a standard oxalic acid solution.
3. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution.
4. Estimation of Oxalic acid by $KMnO_4$ using a standard oxalic acid solution.
5. Estimation of $K_2Cr_2O_7$ by Thio solution.
6. Estimation of Iron (II) by $KMnO_4$ using a standard Mohr's salt solution.
7. Estimation of $KMnO_4$ by thio using a standard potassium dichromate solution.
8. Estimation of Iron (II) by $K_2Cr_2O_7$ using a standard Mohr's salt solution.
9. Estimation of Copper (II) sulphate by $K_2Cr_2O_7$ solution.
10. Estimation of Copper by standard $CuSO_4$ solution using thio.

UNIT V: Complexometric and applied titrations (18 Hours)

1. Estimation of magnesium (II) by EDTA.
2. Estimation of calcium (II) by EDTA.
3. Estimation of zinc (II) by EDTA.
4. Estimation of total hardness of water.
5. Estimation of antacid.

Teaching Methodology	chalk and talk, laboratory demonstrations
Assessment Methods	Viva Voce, Experiment evaluation, test

Books for Study:

1. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry* (9th Ed.). Brooks/Cole Cengage Learning.
2. Coulling, A. (2013). *A Complete Guide to Volumetric Analysis* (1st Ed.). CreateSpace Independent Publishing Platform.
3. Bassett, J. (1985). *Vogel's Textbook of Quantitative Inorganic Analysis* (4th Ed.). ELBS Longman.

Books for Reference:

1. Gary A Christian, (2003). *Analytical Chemistry*, (6th Ed.). John Wiley and sons Ltd.
2. Vogel, A. I. (2000). *Vogel's Textbook of Quantitative Chemical Analysis* (6th Ed.). Pearson Education.

Websites and eLearning Sources:

1. https://edu.rsc.org/resources/titration-screen-experiment/2077.article
2. https://www.pearson.com/channels/analytical-chemistry/learn/jules/ch-1-chemical measurements/volumetric-analysis

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Recall the basic principles of laboratory safety and chemical handling.	**K1**
CO2	Know the handling of chemicals and glassware in the laboratory.	**K2**
CO3	Know the terms and principles in volumetric estimations.	**K3**
CO4	Develop strategies to analyze inorganic compounds.	**K4**
CO5	Know the methodology and procedure of analysis of inorganic compounds.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
1	**25UCH13CP01**		**Core Practical - 1:** Volumetric Analysis						**6**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	2	2	1	1	3	**2.1**
CO2	2	1	1	2	3	3	3	3	2	1	**2.3**
CO3	2	3	3	1	1	1	3	3	3	3	**2.5**
CO4	2	3	2	2	2	3	3	3	1	1	**2.2**
CO5	3	3	3	2	2	3	3	2	1	3	**2.1**
Mean Overall Score											**2.12 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UCH13AC01	**Allied Course - 1:** Mathematics for Chemistry - 1	6	4

Course Objectives
To train the students in mastering the techniques of various branches of Mathematics
To motivate the students to apply the techniques in their respective major subjects
To introduce the basic knowledge of differentiation
To understand the concept of matrices and its applications
To solve the problems in trigonometry and in Series summations

UNIT I **(18 Hours)**

Partial fractions – Binomial series - Summation of series- Finding terms- Coefficient of x^n.

UNIT II **(18 Hours)**

Exponential series- Summation –Logarithmic series- Summation.

UNIT III **(18 Hours)**

Matrices- Rank of a matrix-Solving simultaneous linear equation in three unknowns using Elementary Operations method - Eigen values and Eigen vectors - Verification of Cayley Hamilton theorem.

UNIT IV **(18 Hours)**

Expansion of cos $n\theta$ and sin $n\theta$ -Powers of sines and cosines of θ in terms of functions of multiples of θ-Expansion of sin θ and cos θ in a series of ascending powers of θ.

UNIT V **(18 Hours)**

Higher Derivatives- Formation of equations involving derivatives-Applications of Leibnitz's theorem.

Teaching Methodology	Chalk and Talk, Lectures, Peer teaching, GD
Assessment Methods	Snap test, Seminar, MCQ, Group work

Books for Study:

1. Narayanan, S., Rao, S. H., & Pillay, T. K. M. (2009). *Ancillary mathematics vol.- I.* Viswanathan, S., Printers & Publishers Pvt Ltd.
   Unit I: Chapter1, Sections 1.1-1.2*(Page No: 1-27)*
   Unit II: Chapter1, Sections 1.3-1.4*(PageNo:28 -53)*
   Unit III: Chapter3, Sections 3.2 -3.4 *(PageNo:137 -160)*
   Unit IV: Chapter5, Sections 5.1-5.3*(PageNo:220-242)*
   Unit V: Chapter 6, Section 6.1*(PageNo:266-281)*

Books for Reference:

1. J. P. Singh (2010), Calculus, Ane Books Pvt Ltd.
2. Dr. P.R. Vittal & Dr. V. Malini (2016), Algebra, Margham Publications Pvt Ltd.

Websites and eLearning Sources:

1. https://tutorial.math.lamar.edu/classes/calcii/binomialseries.aspx
2. https://uom.lk/sites/default/files/math/files/MATRICES-COMPLETE_LECTURE_NOTE.pdf
3. https://tutorial.math.lamar.edu/classes/calci/higherorderderivatives.aspx

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Acquire knowledge of basics of mathematics like series, matrices, trigonometry and differential calculus.	**K1**
CO2	Understand the process of finding the sum of the series, eigen values and eigen vectors, higher derivatives of a function and trigonometric expansions.	**K2**
CO3	Apply the binomial theorem, Cayley Hamilton Theorem, trigonometric expressions, higher derivatives of functions in working out problems they encounter in chemistry.	**K3**
CO4	Analyse the importance of mathematical concepts in giving solution to chemistry based real time problems.	**K4**
CO5	Evaluate eigen values, eigenvectors, summation of series in solving problems on chemistry.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**25UCH13AC01**		**Allied Course - 1:** Mathematics for Chemistry - 1							**6**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	3	1	2	3	2	3	1	**2.3**
CO2	3	3	1	2	2	3	3	2	2	2	**2.3**
CO3	2	3	2	2	2	3	2	2	2	2	**2.2**
CO4	2	2	2	2	2	2	2	2	3	2	**2.1**
CO5	3	2	2	1	2	3	2	2	3	2	**2.2**
									Mean Overall Score		**2.22 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UHE14VE01	**Value Education - 1:** Essentials of Humanity	2	1

Course Objectives
To identify one's own potentials, strengths and weaknesses
To identify various challenges (physical, emotional and social) in adolescence
To consciously overcome one's challenges and move towards self-esteem
To maximize one's own potential in enabling holistic development
To assimilate human values comprehensively

UNIT I: Value Education (6 Hours)

Introduction to values - Characteristics and Roots of Values - Value Education & Value Clarification - Moral Characters - Kinds of Values - Objectives of Values

UNIT II: Human Personality (6 Hours)

Personality: Introduction, Traits, Theories, Integration & Factors influencing the development of personality - Discovering self - Defense Mechanism -Power of positive thinking - Why worry?

UNIT III: Human Development (6 Hours)

Areas of Development: Physical, Intellectual, Emotional, Social Development, Moral & Spiritual development – Practical Sessions on Health and Wellness

UNIT IV: Responsible Parenthood (6 Hours)

Human Sexuality - Marriage and Family - Sex and Love - Characteristics of Responsible parent - Causes of Marriage disharmony - Art of wise parenting

UNIT V: Gender Equality and Empowerment (6 Hours)

Historical perspective - Women in Independence struggle - Women in Independent India - Education & Economic development - Crimes against Women - Women rights - Time-line of Women achievements in India

Teaching Methodology	Power point
Assessment Methods	Seminars, Reports, Group Discussion, Online Tests, Assignments

Books for Study:

1. Department of Human Excellence. (2023). *Essentials of Humanity.* St. Joseph's College.

Books for Reference:

1. Alex, K. (2009). *Soft Skills.* S. Chand.
2. Norman Vincent Peale (1952). *The Power of Positive Thinking Norman Vincent Peale.* New York Times
3. Kalam, A.A. P. J. (2012). *You Are Unique.* Punya Publishing.

Websites and eLearning Sources:

1. http://livingvalues.net. Accessed 05 March 2021.
2. https://www.psychologytoday.com/us/basics/defense-mechanisms.Accessed 12 March 2025.
3. http://www.apa.org/topics/personality#. Accessed 05 March 2021.
4. http://www.peacecorps.gov/educators/resources/global-issues-gender-equaligy-and-womens-empowerment/. Accessed 05 March 2021.
5. https://www.nextias.com/blog/women-empowerment/Accessed 12 March 2025.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Recall the prescribed values and the dimensions.	**K1**
CO2	Examine themselves by learning the developmental changes happening in the course of their lifetime.	**K2**
CO3	Apply the trained values in the day-to-day life.	**K3**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**25UHE14VE01**		**Value Education - 1:** Essentials of Humanity							**2**	**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	3	2	3	3	**2.8**
CO2	3	2	2	3	3	2	3	3	2	2	**2.5**
CO3	2	3	3	3	2	3	3	3	3	3	**2.8**
										Mean Overall Score	**2.7 (High)**

SCHEME OF VALUATION
INTERNAL

CIA 100 Marks

Cumulative mark of Regular Practical Classes	50 Marks
Two CIA tests	50 Marks

For Each CIA Test	100 marks
Procedure	10 Marks
Record	10 Marks
Viva	10 Marks
Results	70 Marks
Table	10marks
Calculation	10 marks

Results 50 marks

Scheme of valuation

< 2% 40 Marks
< 3 % 30 Marks
< 4 % 20 Marks
> 4% 10 Marks

EXTERNAL Total 100 Marks

Procedure	10 Marks
Viva	10 Marks
Results/Analysis	80 Marks

Marks distribution for 80 Marks

Table	10marks
Calculation	20 marks
Results	50 marks

Scheme of valuation

< 2% 40 Marks
< 3 % 30 Marks
< 4 % 20 Marks
> 4% 10 Marks

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UTA21GL02	பொதுத்தமிழ் – 2: General Tamil - 2	4	3

கற்றலின் நோக்கங்கள் (Course Objectives)
காப்பியங்களின் தோற்றம், வரையறை, வகைகள் ஆகியவற்றை அறிந்து கொள்ளல்
பெருங்காப்பியம், சிறுகாப்பியம் இடையேயான வேறுபாட்டைக் கண்டறிதல்
சைவ வைணவ சமயப் பாடல்களில் சிறப்பினை ஒப்பிடுதல்
காப்பியங்கள் வெளிப்படுத்தும் விழுமியங்களையும் உணர்தல்
சமூகத்திற்கும், காப்பியத்திற்குமான பிணைப்புகள் குறித்துத் தெரிந்துகொள்ளுதல்

அலகு-1 **(12 மணி நேரம்)**

சிலப்பதிகாரம் - ஆய்ச்சியர் குரவை
மணிமேகலை – ஊர் அலர் உரைத்த காதை
இலக்கிய வரலாறு – சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய
இலக்கணம் – அகப்பொருள் இலக்கணம்

அலகு-2 **(12 மணி நேரம்)**

திருநாவுக்கரசர் – திருவதிகை வீரட்டானம்
(கூற்றாயினவாறு எனத் தொடங்கும் முதல் 10 பாடல்கள்)
திருவாசகம் - அடைக்கலப்பத்து
(செழுக்கமலத் திரளனநின் எனத் தொடங்கும் முதல் 10 பாடல்கள்)
திருமந்திரம் – மாகேசுர பூசை (11 பாடல்கள்)
சிவவாக்கியர் பாடல்கள் (15 பாடல்கள்)
பாடல் எண்கள் – 16,22,27,33,34,35,37,38,47,81,91,225,237,242,495

அலகு-3 **(12 மணி நேரம்)**

பெரியாழ்வார் திருமொழி – திருப்பல்லாண்டு – தாலப்பருவம் (10 பாடல்கள்
திருமங்கையாழ்வாரின் பெரிய திருமொழி – திருவரங்கம் -1 (10 பாடல்கள்)
கம்பராமாயணம் – கங்கை காண் படலம் - (தேர்ந்தெடுக்கப்பட்ட 35 பாடல்கள்)
பாடல் எண்கள்: 1, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 22, 24, 25, 26, 27, 29, 30, 32,33,35,39,40,41,42,43,47,62,64,65,67,69,70
நற்றமிழ்க் கோவை – முதல் மூன்று கட்டுரைகள்.

அலகு-4 **(12 மணி நேரம்)**

சீறாப்புராணம் – நதி கடந்த படலம் – 1 முதல் 31 முடிய உள்ள பாடல்கள்
கள்வரை நதிமறித்த படலம் – 1 முதல் 16 முடிய உள்ள பாடல்கள்
இலக்கணம் – புறப்பொருள் இலக்கணம்
இலக்கிய வரலாறு – தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள் முடிய

அலகு-5 **(12 மணி நேரம்)**

வீரமாமுனிவரின் தேம்பாவணி – (காசா) காசை சேர் படலம்
(1 முதல் 50 முடிய உள்ள பாடல்கள்)
சீனயி (சீனாய்) - மாமலை காண்படலம் -(1 முதல் 56 முடிய உள்ள பாடல்கள்)
நற்றமிழ்க் கோவை – இறுதி மூன்று கட்டுரைகள்.

கற்பித்தல் முறை (Teaching Methods)	விரிவுரை **(Lecture),** காணொளிக் காட்சி **(Videos),** விளக்கக் காட்சி **(PPT presentation)**
மதிப்பீட்டு முறைகள் (Assessment Pattern)	இயங்கலைத்தேர்வு **(Online Test),** நூல் நோக்குத் தேர்வு (open book test) ஒப்படைவு **(Assignment),** வினாடி வினா **(Quiz),** கருத்துரை **(Seminar)**

பாடநூல்கள்:

1. பொதுத்தமிழ் (2025), தமிழாய்வுத்துறை, தூய வளனார் கல்லூரி
2. நற்றமிழ்க் கோவை - கட்டுரைத்தொகுப்பு (2025), தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி

Websites and eLearning Sources:

1. https://www.tamiluniversity.ac.in/english/library2-/digital-library/
2. https://www.tamilvu.org/ta/library-l3100-html-l3100pl1-132372
3. https://www.tamilvu.org/ta/courses-degree-p202-p2021-html-p202121-28011
4. https://www.chennailibrary.com/vaishnava/naalayiradivyaprabhandham.html

5. https://www.tamilvu.org/ta/library-l4310-html-l4310por-141616
6. https://www.tamilvu.org/slet/l4100/l4100pd2.jsp?bookid=80&pno=287

Course Outcomes

CO No.	CO–Statements **இப்பாடத்தின் நிறைவில் மாணவர்கள்**	Cognitive Levels (K –Levels)
CO–1	பழந்தமிழர் வாழ்வியலையும் பன்முக ஆளுமைகளையும் அறிவர்	K1
CO–2	தமிழரின் பல்துறை அறிவு, மரபு போன்றவற்றை அறிந்து கொள்வர்.	K2
CO–3	பெருங்காப்பிய மரபிற்குள் வரும் இலக்கியங்களை அடையாளம் காண்பதோடு அவற்றை விளக்கும் திறனையும் பெறுவர்.	K3
CO–4	புராண இதிகாச மரபுகளிலிருந்து, காப்பியம் என்னும் புதிய இலக்கிய வடிவம் உருவான விதத்தை மதிப்பிடுவர்.	K4
CO–5	இலக்கிய வரலாறு, இலக்கணம், காப்பியங்கள் ஆகியவற்றைக் கற்பதன் வழி போட்டித் தேர்வுகளை எதிர்கொள்ளும் திறன் பெறுவர்	K5

Relationship Matrix											
Semester	Course Code			Title of the Course						Hours	Credits
2	25UTA21GL02			பொதுத்தமிழ் – 2: General Tamil - 2						4	3
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	3	3	3	3	3	3	2.8
CO-2	3	2	2	2	2	3	3	3	2	2	2.4
CO-3	2	3	1	3	1	3	3	3	1	2	2.2
CO-4	3	3	2	3	1	3	3	3	1	3	2.5
CO-5	3	3	2	2	3	3	3	2	2	2	2.5
Mean Overall Score											2.48 (High)

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	**25UFR21GL02**	Language French – 2	**4**	**3**

Course Objectives
Develop Communicative Competence in French enabling students to engage in simple, real-life conversations and interactions
Master Fundamental Grammar and Vocabulary by understanding and applying essential grammatical structures in context
Explore Francophone Culture and Civilization by integrating cultural elements of French-speaking regions
Enhance Practical Language Use in Everyday Situations
Express Ideas in Different Contexts Using Appropriate Tenses

UNIT I **(12 Hours)**

1. Titre - Qu'est-ce qu'on fait aujourd'hui ?
2. Lexique –l'heure, les activités quotidiennes, la description physique
3. Grammaire –les verbes pronominaux au présent, le passé récent, la fréquence
4. Production orale- demander l'heure, proposer une sortie
5. Production écrite - présenter ses activités quotidiennes, décrire une personne

UNIT II **(12 Hours)**

6. Titre - Chez -moi
7. Lexique – le logement, les meubles, les pièces, l'équipement
8. Grammaire – le passe compose avec avoir, les pronoms COD
9. Production orale- s'informer sur un logement
10. Production écrite - expliquer un problème domestique, écrire une annonce pour un logement

UNIT III **(12 Hours)**

11. Titre - En forme
12. Lexique – les parties du corps, les maladies, les médicaments, les sports
13. Grammaire –Le passé composé avec être, le pronom 'y',
14. Production orale- parler de sa santé, exprimer une émotion positive
15. Production écrite - Donner un conseil, exprimer son accord ou son désaccord

UNIT IV **(12 Hours)**

16. Titre - Bonne vacances
17. Lexique – les destinations, l'hébergement, la réservation, la nature
18. Grammaire – la comparaison, les verbes impersonnels à l'imparfait comme c'était
19. Production orale- réserver une chambre a l'hôtel, décrire une ville ou un paysage
20. Production écrite - réaliser une brochure touristique, écrire une carte postale

UNIT V **(12 Hours)**

21. Titre - Au travail
22. Lexique – les études, les disciplines, les lieux de travail, les taches
23. Grammaire – la durée, les pronoms relatifs
24. Production orale- parler de ses études et son projet professionnel
25. Production écrite - comparer le système scolaire français et indien
26. Indian knowledge system–Highlighting on Gurukulam Education System that focuses on traditional teacher-student relationships, oral learning methods, and holistic education while discussing education systems in India vs. France (5%)

Teaching Methodology	Visual-Linguistic Learning, Descriptive & Interpretative Learning, experiential learning, The Lexical Approach, Differentiated Instruction
Assessment Methods	*Role -play:* A mock phone call on hotel reservation, discuss daily routines, housing, and health. (Rubric – graded on grammatical accuracy, and use of appropriate vocabulary) *Picture description activity:* Describe a landscape or travel destination shown in a picture. (Rubric – Assessed on descriptive abilities and vocabulary use) *Experimental learning task:* Doctor-patient conversation about a health issue, Conduct a mock interview about career plans. (Rubric – Assessed on real-life application of language skills) *Project based assessment*: Create a travel brochure for a French-speaking destination, make a poster comparing education in France and India (Rubric – Assessed on Application of language skills in a creative way) *Written assessment*: Write a short daily routine using time expressions, write a postcard describing a recent trip (Rubric – Assessed on ability to write structured texts related to themes)

Books for Study:

1. Mensdorff - Pouilly, L., Opatski, S., Petitmengin, V., Pons, S., Sperandio, C., Djimli, H., & Veldeman - Abry, J. (2022). *Édito A1: Méthode de français* (2nd ed.). Didier FLE, Hatier. (p.87-p.165)

Books for Reference:

1. Dauda, P., Giachino, L., & Baracco, C. (2020). *Génération A1*. Didier.
2. Mérieux, R., &Loiseau, Y. (2012). *Latitudes A1*. Didier.

Websites and eLearning Sources:

1. https://www.podcastfrancaisfacile.com
2. https://www.flevideo.com
3. https://savoirs.rfi.fr/fr
4. https://www.french4me.net/
5. https://apprendre.tv5monde.com/en

Course Outcomes		
CO No.	**CO–Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K –Levels)**
CO1	Talk about daily routines, tell the time, describe people, and propose social outings using appropriate vocabulary and verb structures.	**K1**
CO2	Inquire about housing, describe household items, explain domestic issues, and write advertisements or announcements for accommodations.	**K2**
CO3	Describe body parts, discuss health conditions, give advice, express emotions, and use past tense structures to narrate past experiences.	**K3**
CO4	Make hotel reservations, describe destinations and landscapes, compare experiences, and write postcards or travel brochures.	**K4**
CO5	Discuss education, career plans, and workplace responsibilities while comparing educational systems in France and India.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
2	**25UFR21GL02**			Language French – 2					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	1	1	2	2	2	3	2	2	1.9
CO2	2	2	2	3	1	3	3	2	3	3	2.4
CO3	2	3	2	1	2	2	1	3	2	1	1.9
CO4	3	2	2	2	2	3	2	1	2	3	2.2
CO5	3	3	3	2	3	2	3	2	3	2	2.6
Mean Overall Score											**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	**25UHI21GL02**	Language Hindi - 2	**4**	**3**

Course Objectives
To understand the basics of Hindi Language
To make the students to be familiar with the Hindi words
To enable the students to develop their effective communicative skills in Hindi
To introduce the socially relevant subjects in Modern Hindi Literature
To empower the students with globally employable soft skills

UNIT I **(12 Hours)**

1. Moun hi Manthra Hay
2. Letter Writing - Chutti Patra
3. Bakthikal - Namakarn
4. Sarkari Kariyalayom Ka Naam

UNIT II **(12 Hours)**

5. Baathcheeth - Aspathal Mein
6. Letter Writing - Rishthedarom ko Patra
7. Bakthikal - Samajik Paristhithiyam
8. Kriya

UNIT III **(12 Hours)**

9. Premchand
10. Kriya visheshan
11. Letter Writing - Naukari Keliye Avedan Patra
12. Bakthikal - Sahithyik Paristhithiyam

UNIT IV **(12 Hours)**

13. Kabeer ke Dohae
14. Samas
15. Letter Writing - Kitab Maangne Keliye Patra
16. Bakthikal - Salient Features, Main Division

UNIT V **(12 Hours)**

17. Anuvad
18. Sandhi
19. Bakthikal - Visheshathayem
20. Apathit Gadyansh

Teaching Methodology	Peer Instruction Exercise, Videos, PPT, Quiz, Group Discussion
Assessment Methods	Group Discussion, Seminar, Snap Test

Books for Study:

1. Viswanath Tripaty. *(2021). Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd.
2. Kamathaprasad Gupth, M. (2020). *Hindi Vyakaran*. Anand Prakashan.
3. Dr. Sadananth Bosalae. *(2020). kavya sarang*, Rajkamal Prakashan.

Books for Reference:

1. Acharya Ramchandra Shukla. (2021). *Hindi Sahitya Ka Itihas*. Prabhat Prakashan.
2. Krishnakumar Gosamy. (2023). *Anuvad vigyan ki Bhumika*. Rajkamal Prakashan.
3. Aravind Kumar. (2022). *Sampoorna Hindi Vyakaran our Rachana*, Lucent publisher.
4. Lakshman Prasad Singh. (2021). *Kavya ke sopan*. Bharathy Bhavan Prakashan.

Websites and e-Learning Sources:

1. https://hindigrammar.in/sandhi.html
2. https://www.successcds.net/class10/hindi/samas-in-hindi

3. https://mycoaching.in/kriya-ke-bhed-verb-in-hindi
4. https://namastesensei.in/adverb-in-hindi-examples/
5. https://viahindi.in/hindi-vyakaran/sandhi-paribhasha-prakar-or-udaharan

Course Outcomes		
CO No.	**CO–Statements** On successful completion of the course, the student will acquire thelisted skills	**Cognitive Levels (K-Levels)**
CO1	Find out the Terms & Expressions related to letter writing.	**K1**
CO2	Providing knowledge of Letter writing in Hindi.	**K2**
CO3	Complete the sentences in Hindi using basic grammar.	**K3**
CO4	Analyze the social & political conditions of Devotional period in Hindi Literature.	**K4**
CO5	Justify the human values stressed on the works of Hindi writers	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**				**Hours/ week**			**Credits**
2	**25UHI21GL02**			Language Hindi – 2				**4**			**3**
Course Outcomes (Cos)	**Programme Outcomes (Pos)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	3	2	2	3	3	3	2	2	2.5
CO2	1	3	1	2	2	3	3	3	2	3	2.3
CO3	3	2	3	2	2	3	2	3	2	2	2.4
CO4	2	3	3	1	3	2	3	2	1	2	2.2
CO5	3	2	2	2	3	2	3	2	3	2	2.4
								Mean Overall Score			**2.36 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	**25USA21GL02**	Language Sanskrit - 2	**4**	**3**

Course Objectives
To bring out the salient aspects of classical Sanskrit poetry
To introduce court epics in Sanskrit
To train students in declensions of pronouns in Sanskrit
To coach the students in the conjugation patterns of verbs in Sanskrit
To offer coaching in morpho-phonemic rules and their applications in Sanskrit

UNIT I **(12 Hours)**

Asmathi usmath tat kim (MFN) sarva naama sabdaha

UNIT II **(12 Hours)**

Sandhi Niyamaah Abhyaash (Guna, Visarga, Dirgha, Vrddhi)

UNIT III **(12 Hours)**

Lang lakaarah Kriyapadaani Prayoga Vivaranam

UNIT IV **(12 Hours)**

Raguvamsaha Pratama sargaha (1 –15 slokas)

UNIT V **(12 Hours)**

Suvacanani Vakya Prayoga Vivaranam

Teaching Methodology	Videos, PPT, Blackboard, Demonstration, Exercises
Assessment Methods	Seminar, Quiz, Group Discussion.

Books for Study:

1. Saralasamkritham Siksha ,2021
2. Dhaatu Rupa Manjari ,2021

Books for Reference:

1. Paindrapuram Ashram, Srirangam – 620 006 Gopalavimshanthi 2021
2. R.S. Vadhyar & Sons book – Seller and Publishers, Kalpathi, Palghat – 678003, Kerala, South Inida, shabdha manjari
3. Kulapthy, K.M Saral sankrit Balabodh, Bharathiys Vidya Bhavan, Munshimarg Mumbai – 400007, 2020

Websites and eLearning Sources:

1. https://www.meritnation.com
2. https://www.aplustopper.com
3. https://mycoaching.in/lang-lakar
4. https://sanskritdocuments.org/sites/giirvaani/giirvaani/rv/sargas/01_rv.htm
5. https://resanskrit.com/blogs/blog-post/sanskrit-shlok-popular-quotes-meaning-hindi-english

Course Outcomes		
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO–1	Remembering names of different objects, remembering different verbal forms and sandhi	**K1**
CO–2	Contrast different verbal forms Explain good sayings, Relate good saying to life.	**K2**
CO–3	Apply and build small sentences	**K3**
CO–4	Analyze different forms of Verbs and nouns	**K4**
CO–5	Appreciate subhashitas and Sanskrit poetry	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25USA21GL02**			Language Sanskrit - 2						**4**	**2**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	2	1	3	2	2	2	3	3	2	1	2.1
CO-2	3	2	3	2	2	3	2	3	3	2	2.5
CO-3	2	2	3	2	2	2	2	3	3	1	2.1
CO-4	3	2	3	3	1	2	3	3	3	1	2.4
CO-5	3	2	2	2	3	2	2	3	3	1	2.3
Mean Overall Score											**2.28 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UEN22GE02A	**General English – 2:** Pre-Intermediate Stream	5	3

Course Objectives (CO)
To strengthen listening and speaking skills for identifying key ideas and details
To improve reading comprehension and analyze different texts
To express ideas clearly in conversations and presentations, using correct grammatical structures.
To develop writing skills by creating clear and structured texts
To assess and improve language use in both spoken and written communication

UNIT I: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening to respond to story-based questions
	(Practice)	**:**	"The Hare and His Friends"
Reading:	**(Skill)**	**:**	Understanding and interpreting proverbs
	(Practice)	**:**	"Necessity is the Mother of Invention"
Grammar:	**(Practice)**	**:**	Present Continuous Tense; Past Continuous Tense
Vocabulary:	**(Practice)**	**:**	Weather and Seasons
Speaking:	**(Skill)**	**:**	Describing on-going actions in the present and the past to describe real-life situations and activities
	(Practice)	**:**	Ongoing Actions: Present & Past
Writing:	**(Skill)**	**:**	Writing a biography of a famous personality using given details
	(Practice)	**:**	Writing a Biography

UNIT II: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening to identify factual details
	(Practice)	**:**	Recycling
Reading:	**(Skill)**	**:**	Reading to convert a story into a meaningful dialogue
	(Practice)	**:**	The Shepherd and the Stranger
Grammar:	**(Practice)**	**:**	Future Expressions: Simple Future & 'Going to'; Simple Present, Present Continuous and Future Continuous Tenses
Vocabulary:	**(Practice)**	**:**	Groceries
Speaking:	**(Skill)**	**:**	Developing conversational fluency by practising conversations on familiar and everyday topics
	(Practice)	**:**	Conversations on Familiar and Everyday Topics
Writing:	**(Skill)**	**:**	Writing clear, respectful and relevant online comments
	Practice	**:**	Writing Online Comments

UNIT III: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening for specific information
	(Practice)	**:**	Telephonic Conversation
Reading:	**(Skill)**	**:**	Reading a news report
	(Practice)	**:**	Iron Age in Tamil Nadu Began 5,300 Years Ago
Grammar:	**(Practice)**	**:**	Present Perfect Tense; Past Perfect Tense
Vocabulary:	**(Practice)**	**:**	Kitchen Utensils and Household Appliances
Speaking:	**(Skill)**	**:**	Using polite expressions in conversations to request, seek permission, grant or refuse permission, and apologise
	(Practice)	**:**	Polite Expressions in Conversations
Writing:	**(Skill)**	**:**	Expressing short reflective ideas in writing
	(Practice)	**:**	Thought for the Day

UNIT IV: **(15 Hours)**

Listening:	**(Skill)**	**:**	Predicting content and vocabulary before listening
	(Practice)	**:**	Our Earth
Reading:	**(Skill)**	**:**	Identifying direct and indirect speech
	(Practice)	**:**	Birbal story: "Hot Iron Test"

Grammar:	**(Practice)**	**:**	Active and Passive Voice
Vocabulary:	**(Practice)**	**:**	Human Diseases
Speaking:	**(Skill)**	**:**	Using polite expressions in conversations to interrupt, make suggestions, and agree or disagree
	(Practice)	**:**	Polite Expressions in Conversations
Writing:	**(Skill)**	**:**	Writing a report on a given topic
	(Practice)	**:**	Report Writing

UNIT V: **(15 Hours)**

Listening:	**(Skill)**	**:**	Listening to understand formal speeches
	(Practice)	**:**	"A Tryst with Destiny" by Jawaharlal Nehru
Reading:	**(Skill)**	**:**	Reading to understand an essay
	(Practice)	**:**	"Secularism"
Grammar:	**(Practice)**	**:**	Adverbs; Prepositions
Vocabulary:	**(Practice)**	**:**	**Occupations**
Speaking:	**(Skill)**	**:**	Delivering a short prepared speech on a familiar or inspiring topic
	(Practice)	**:**	Delivering a Short Speech
Writing:	**(Skill)**	**:**	Writing a clear and well-structured essay on a given topic
	(Practice)	**:**	Essay Writing

Teaching Methodology	Lectures, task-based activities, audio-visual listening tasks, guided reading and writing exercises, discussions
Assessment Method	Listening and reading comprehension exercises, verbal presentations, role plays and conversations, writing tasks

Books for Study:

Dr. M. John Britto, Dr. B. Sam Jerome Sharone, and Dr. S. Sajeev. *Nurturing English Skills*. Emerald Publishers, 2025.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recognize key ideas and details in spoken and written texts, demonstrating effective listening and comprehension skills.	**K1**
CO2	Understand and interpret different types of texts, enhancing reading comprehension and critical thinking abilities.	**K2**
CO3	Apply correct grammatical structures to express ideas clearly in conversations and presentations.	**K3**
CO4	Analyze and organize ideas to write clear, coherent, and well-structured texts for various purposes.	**K4**
CO5	Evaluate and improve language use, refining both spoken and written communication.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
2	**25UEN22GE02A**		**General English – 2:** Pre-Intermediate Stream							**5**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PS02**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	2	3	2	3	2	2	**2.4**
CO2	3	2	2	3	2	3	2	3	2	3	**2.5**
CO3	3	2	2	2	3	2	2	3	2	2	**2.3**
CO4	3	2	2	2	2	2	2	2	2	3	**2.2**
CO5	3	2	3	2	3	2	3	2	3	2	**2.5**
Mean Overall Score											**2.38 (High)**

Semester	Course Code	Title of the Course	Hours/ Week	Credits
2	25UEN22GE02B	**General English – 2:** Intermediate Stream	5	3

Course Objectives
To develop students' ability to listen, speak, read, and write effectively in English through interactive and contextualised activities.
To improve students' understanding and application of essential grammar concepts, including verb usage, auxiliary verbs, modals, adverbs, and sentence structures.
To equip students with strategies to deduce meanings of unfamiliar words using contextual clues.
To foster students' ability to brainstorm, organise information using graphic organisers, and structure written communication effectively for academic and professional contexts.
To enable students to engage in discussions, express opinions, seek and provide information, and navigate real-life situations confidently through role plays.

Unit 1: My College & Studies **15 Hours**

1. Listening:	**(Skill)**	Distinguishing between main ideas and supporting details
	(Practice)	"A Day in the Life of a College Student" (A conversation)
2. Reading:	**(Skill)**	Recognising the structure of written texts
	(Practice)	"Enter to learn, leave to serve"
3. Grammar:	**(Practice)**	Main Verb
4. Vocabulary:	**(Practice)**	Using synonyms as contextual clues to guess the meaning of unfamiliar words
5. Study skill:		Brainstorming to gather ideas in a group
6. Speaking:	**(Skill)**	Asking for, giving and refusing permission – Requesting – Communication repair: Finding about pronunciation, spelling and meaning.
	(Practice)	Role Play
7. Writing:	**(Skill)**	Writing an outline
	(Practice)	Controlled composition: Writing an outline for a given passage

Unit 2: Travel **15 Hours**

1. Listening:	**(Skill)**	Listening for specific details
	(Practice)	"A Perfect Vacation" (A conversation)
2. Reading:	**(Skill)**	Identifying main ideas and supporting details
	(Practice)	"An Unforgettable Ride"
3. Grammar:	**(Practice)**	Auxiliary Verbs
4. Vocabulary:	**(Practice)**	Using antonyms as contextual clues to guess the meaning of unfamiliar words
5. Study skill:		Mind mapping to visually organise information
6. Speaking:	**(Skill)**	Asking for and giving directions – Asking for and giving information
	(Practice)	Role Play
7. Writing:	**(Skill)**	Writing effective paragraphs
	(Practice)	Free-writing composition: An adventurous journey

Unit 3: My Social Network **15 Hours**

1. Listening:	**(Skill)**	Understanding the sequence of ideas
	(Practice)	"My Virtual Friends" (A conversation)
2. Reading:	**(Skill)**	Comprehending infographics
	(Practice)	"Social Media Etiquette
3. Grammar:	**(Practice)**	Modal Auxiliary Verbs
4. Vocabulary:	**(Practice)**	Using definitions and restatements as contextual clues to guess the meaning of unfamiliar words
5. Study skill:		Using graphic organisers (sequence of events chain, timeline, and storyboard)
6. Speaking:	**(Skill)**	Asking for and giving advice – Asking if someone agrees – Agreeing and disagreeing – Warning someone
	(Practice)	Role Play

7. Writing:	**(Skill)**	Developing stories from hints
	(Practice)	Controlled composition: Developing a story from given hints

Unit 4: Shopping **15 Hours**

1. Listening:	**(Skill)**	Detecting signposts
	(Practice)	"Let's go shopping!" (A conversation)
2. Reading:	**(Skill)**	Recognising transition of ideas
	(Practice)	"Adventures of the Grocery Store"
3. Grammar:	**(Practice)**	Adverbs and WH Question Words
4. Vocabulary:	**(Practice)**	Using examples and illustrations as contextual clues to guess the meaning of unfamiliar words
5. Study skill:		Using graphic organisers (Venn diagram, and cause-and-effect map)
6. Speaking:	**(Skill)**	Offering and accepting help – Asking for and giving opinions – Asking for and saying one's preference – Suggesting – Complaining
	(Practice)	Role Play
7. Writing:	**(Skill)**	Describing actions in a story
	(Practice)	Guided composition: Narrating a story in a comic strip

Unit 5: Ceremonies **15 Hours**

1. Listening:	**(Skill)**	Listening to intonations
	(Practice)	"Happy Birthday to You!" (A conversation)
2. Reading:	**(Skill)**	Understanding moods in a reading passage
	(Practice)	"The Light has Gone out" by Jawaharlal Nehru
3. Grammar:	**(Practice)**	Sentences
4. Vocabulary:	**(Practice)**	Using root words as clues to guess the meaning of words
5. Study skill:		Using graphic organisers (idea wheel, idea web, and concept map)
6. Speaking:	**(Skill)**	Using intonations for different types of sentences – Expressing your feelings and emotions – Congratulating and wishing someone – Expressing sympathy
	(Practice)	Role Play
7. Writing:	**(Skill)**	Expressing emotions in narrative writing
	(Practice)	Controlled composition: Describing emotions and feelings conveyed in a picture story

Teaching Methodology	Lectures, Demonstrations, Discussions, Peer-Review Tasks, Role-plays, Pair and group activities
Assessment Tools	Listening and reading comprehension tasks, Individual talks, Role plays, Controlled and guided compositions

Books for Study:

M.S. Xavier Pradheep Singh, Amalaveenus, and A. Napoleon. English and My World, 2025.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify key ideas, supporting details, and organisational patterns in spoken and written texts.	**K1**
CO2	Explain the meaning of conversations and passages by recognising their structure, tone, and purpose.	**K2**
CO3	Use appropriate language functions such as requesting, suggesting, and expressing opinions effectively in real-life interactions.	**K3**
CO4	Compare different communication styles and linguistic features in various types of texts and conversations.	**K4**
CO5	Assess the effectiveness of spoken and written communication, providing constructive feedback for improvement.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25UEN22GE02B**			**General English – 2:** Intermediate Stream						**5**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	2.5	2.5	2.5	2.5	3	2.5	2.5	2.5	3	2.65
CO-2	2.5	3	2.5	2.5	2.5	3	3	2.5	2.5	3	2.7
CO-3	3	2.5	2.5	3	2.5	2.5	2.5	2.5	3	2.5	2.65
CO-4	2.5	2.5	2.5	3	2.5	2.5	2.5	3	2.5	2.5	2.6
CO-5	3	2.5	2.5	2.5	3	2.5	2.5	2.5	3	2.5	2.65
Mean Overall Score											**2.65 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UCH23CC03	**Core Course - 3:** General Chemistry - 2	5	5

Course Objectives
To understand the properties and reactions of group-1 elements
To explain the characteristics, structures and importance of compounds of group 2 elements
To illustrate the isomerism and fundamentals of stereochemistry
To provide a fundamental understanding of thermodynamic principles and their applications in real and ideal gas systems.
To evaluate the types, preparation and properties of colloidal solutions

UNIT I: Group-1 Elements (15 Hours)

Differences between lithium and other group 1 elements - Occurrence and extraction - General characteristics – sizes of atoms and ions, density, ionization energy, electronegativity and bond type, hardness, melting and boiling points, flame colors and spectra - Chemical properties – reaction with water, air and dinitrogen - Oxides, hydroxides, peroxides and superoxides - Biological role of Na^+ and K^+

UNIT II: Group-2 Elements (15 Hours)

Differences between beryllium and other group 2 elements - Occurrence and extraction - General characteristics – sizes of atoms and ions, ionization energy, electronegativity, hydration energies, anomolous behaviour of beryllium, solubility and lattice energy - Structures and importances of compounds of group 2 elements – oxides, peroxides, sulphates, nitrates, hydrides, halides, nitrides and carbides, basic beryllium acetate - Biological role of Ca^{2+} and Mg^{2+}

UNITIII: Isomerism and Fundamentals of Stereochemistry (15 Hours)

Structural isomerism-types, Geometrical isomerism in alkenes-Cis and Trans isomerism, Chirality-Asymmetric centre, Optical activity, specific rotation, Elements of symmetry required for optical activity, Enantiomers, diastereomers, mesocompounds, Optical isomerism in lactic acid and tartaric acid, Types of projection formula –Fischer, Sawhorse, Newman, Flying Wedge, Erythro and threo, Absolute configuration-R & S configurations, Non-carbon chiral centres (Nitrogen,Phosphorus &Sulfur centres)- Relative configuration -*E* and *Z* isomerism.

UNIT IV: Gaseous State (15 Hours)

Kinetic theory of gases- Molecular velocities- Root mean square, average and most probable velocities- Maxwell law for distribution of molecular speed- collision number- mean free path- fundamental gas laws- - universal gas equation – gas constant- deviation from ideal behavior- van der Waals equation- critical phenomenon- PV isotherm for real gases—critical temperature- -critical volume.

UNIT V: Colloids (15 Hours)

Lyophobic and lyophilic colloids, Preparation of colloids by condensation and dispersion methods, Light scattering by colloidal particles, light scattering experiment, Ultra microscope, Electrical properties of colloidal systems, isotonic point, Schulze – Hardy rule, gels, emulsions, micelles.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Lee, J. D. (1996). *Concise Inorganic Chemistry* (5thEd.). Blackwell Science Ltd.
   Unit I & Unit II
2. Bruice, P. Y. (2011). *Organic Chemistry* (8thEd.). Pearson Ltd.
   Unit III
3. Laudner, K. J., & Meiser, J. H. (2006). *Physical Chemistry* (2ndEd.). CBS Publishers and Distributors.
   Unit IV & Unit V

Books for Reference:

1. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry* (5thEd.). Pearson Education.
2. Housecroft, C. E., & Sharpe, A. G. (2012). *Inorganic Chemistry* (4thEd.). Pearson Education.
3. Cotton, F. A., Wilkinson, G., & Gauss, P. L. (1995). *Basic Inorganic Chemistry* (3rd Ed.). John Wiley & Sons.
4. Castellan, G. W. (2004). *Physical Chemistry* (4thEd.). Narosa.
5. Atkins, P. W., & Paula, J. D. (2006). *Physical Chemistry* (8th Ed.). Oxford University Press.
6. Shriver, D., Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2014). *Inorganic Chemistry* (6thEd.). W. H. Freeman and Company.
7. Morrison, R. T., & Boyd, R. T. (2011). *Organic Chemistry* (7th Ed.). Allyn and Bacon Ltd.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=JAU0eubawiA
2. https://www.slideshare.net/pkfaiq/acids-and-bases-47965133
3. https://www.youtube.com/watch?v=dyhwTKRX7dI

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Revise the basic introduction of group 1 elements and their properties.	**K1**
CO2	Compare the different characteristics of group 2 elements.	**K2**
CO3	Examine the isomerism and stereochemistry of compounds.	**K3**
CO4	Apply the concepts of solutions to industrial applications	**K4**
CO5	Analyze the properties of colloidal solutions	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25UCH23CC03**			**Core Course - 3:** General Chemistry - 2						**5**	**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	2	2	3	2	1	2	2	3	2	**2.0**
CO2	2	2	3	2	2	2	2	3	2	2	**2.2**
CO3	1	2	2	3	2	1	2	2	3	2	**2.0**
CO4	2	2	2	2	3	2	2	2	2	3	**2.2**
CO5	3	2	2	2	2	3	2	2	2	2	**2.2**
										Mean Overall Score	**2.12 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UCH23CP02	**Core Practical - 2:** Inorganic Qualitative Analysis	6	3

Course Objectives
To know the lab safety and identify nature of chemicals
To understand the principles of qualitative analysis for detection of inorganic cations.
To apply the principles of qualitative analysis for detection of inorganic anions.
To illustrate the techniques of semi micro qualitative analysis of inorganic salt mixtures.
To eliminate the interfering acid radicals.

UNIT I: Lab Safety, Chemicals and Glassware (18 Hours)

Philosophy of lab safety – first–aid techniques – general work culture inside the chemistry lab– importance of wearing lab coat, eye glasses.

Personal protection – nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes – glassware – handling of glassware – handling of different types of equipment's like Bunsen burner, centifuger, Kipp's apparatus, etc. – ventilation facilities.

UNIT II: General Principles of Qualitative Analysis (18 Hours)

Principle of flame test – concept of solubility and solubility product – theory of acids and bases – concept of pH and buffer action – common ion effect – redox reactions – theory of testing acid radicals (simple and interfering) – principle of grouping of cations – theory of testing cations.

UNIT III: Semi-micro Qualitative Analysis - I (18 Hours)

Analysis of simple acid radicals:

Carbonate, Sulphide, Sulphate, Chloride, Bromide, Iodide, Nitrate

Analysis of interfering acid radicals:

Fluoride, Oxalate, Borate, Phosphate, Chromate

UNIT IV: Semi micro Qualitative Analysis - II (18 Hours)

Elimination of interfering acid radicals

Fluoride, Oxalate, Borate, Phosphate, Chromate

Identifying the groups of basic radicals

Group I : Ag^{+},Pb^{2+}

Group II : IIA – Cu^{2+}, Cd^{2+}, Hg^{2+}, Pb^{2+}, Bi^{3+}

IIB – Sn^{2+}, Sn^{4+}

Group III : Fe^{3+}, Al^{3+}, Cr^{3+}

Group IV : Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}

Group V : Ca^{2+}, Ba^{2+}, Sr^{2+}

Group VI : Mg^{2+}, NH_4^{+}

UNIT V: Semi micro Qualitative Analysis - III (18 Hours)

Analysis of basic radicals (group–wise): Lead, Copper, Bismuth, Cadmium, Iron, Aluminium, Chromium, Zinc, Manganese, Nickel, Calcium, Strontium, Barium, Magnesium, Ammonium.

Analysis of a mixtures containing two cations and two anions of which one is interfering type.

Teaching Methodology	Chalk and talk, demonstrations, demo videos
Assessment Methods	MCQ, Viva Voce, each experiment evaluation, test

Books for Study:

1. Svehla, G. (2012). *Vogel's Qualitative Analysis*, (7th Ed.). Pearson Education.
2. *Lab manual*, Department of Chemistry, St. Joseph's College, Tiruchirappalli.
3. Venkateswaran, V., Veeraswamy, R., Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry*, (2nd Ed.). Sultan Chand and Sons.

Books for Reference:

1. Ghosh, A. S. K. (2002). *A Textbook of Qualitative Inorganic Analysis*, **(**11th Ed.). S. Chand & Company Ltd.
2. Subramanian, M. P. S. V. (2011). *Qualitative Inorganic Analysis*, **(**3rd Ed.). New Age InternationalPublishers.
3. Woollins, J. D. (1987). *Elementary Practical Inorganic Chemistry*, **(**1st Ed.). Longman.
4. Venkataraman, S. V. G. N. (1991). *Semimicro Qualitative Inorganic Analysis*, **(**2nd Ed.). Tata McGraw-Hill Education.
5. Ghosh, P. S. K. (2005). *Textbook of Qualitative Analysis*, (5th Ed.). S. Chand & Company Ltd.

Websites and eLearning Sources:

1. https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm107.pdf
2. https://www.youtube.com/watch?v=cEOvj6jkdDw
3. https://www.bu.edu/ehs/ehs-topics/chemical/safe-handling-and-storage-of-chemicals/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Know the lab safety and identify nature of chemicals	**K1**
CO2	Understand the principles of qualitative analysis for detection of inorganic cations.	**K2**
CO3	Apply the principles of qualitative analysis for detection of inorganic anions.	**K3**
CO4	Illustrate the techniques of semi micro qualitative analysis of inorganic salt mixtures.	**K4**
CO5	Eliminate the interfering acid radicals.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
2	**25UCH23CP02**	**Core Practical - 2:** Inorganic Qualitative Analysis								**6**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	4	1	3	2	2	3	2	2	1	**2.2**
CO2	1	2	2	1	2	2	3	2	4	3	**2.2**
CO3	3	3	2	1	3	1	2	4	3	3	**2.4**
CO4	2	3	1	3	2	1	2	3	2	3	**2.2**
CO5	3	1	3	2	1	2	2	4	2	3	**2.3**
Mean Overall Score											**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UCH23AC02	**Allied Course - 2:** Mathematics for Chemistry - 2	6	4

Course Objectives
Motivating students to apply various techniques of integration in their major subjects.
Understanding the concept of definite integral.
Analyzing the concepts of Homogeneous and non-homogeneous equations.
Solving problems in differential equations.
Applications of Transforms in Differential equations.

UNIT I **(18 Hours)**

Integration - Integrals of functions containing linear functions of x - Integrals of functions involving $a^2 \pm x^2$ - Integrals of rational algebraic functions - Integration of irrational functions.

UNIT II **(18 Hours)**

Properties of definite integrals - Simple applications - Integration by parts- Bernoulli's formula - Evaluation of double integrals (omit problems involving changing the order of Integration and applications).

UNIT III **(18 Hours)**

Differential equations of first order - variable separable - Homogeneous equations - Non- homogeneous equations - Linear equation - Bernoulli's equation.

UNIT IV **(18 Hours)**

Second order linear equations with constant coefficients - Particular Integrals for e^{kx}, sin kx, cos kx, x^n and $e^{kx}X$.

UNIT V **(18 Hours)**

Laplace transforms - Definition - Some general theorems - Inverse transform - Solving ordinary differential equations using Laplace transformation.

Teaching Methodology	Chalk and Talk method, Problem solving
Assessment Methods	Snap Test, MCQ

Books for Study:

1. Narayanan, S. & Hanumanth, R., Pillay, T.K.M., & Kandaswamy, P. (2009). *AncillaryMathematics, Volume II.* Viswanathan Pvt. Ltd.
   Unit I: Chapter 1: Sec 6.1, 6.2, 7 (omit 7.4), 8 case (i) to (iv) only, pages: 7-13, 23-31, 39-47.
   Unit II: Chapter 1: Sec. 11, 12, 15, pages: 61 - 72, 93 and 94; Chapter 3: Sec. 2.2, pages: 163- 170.
   Unit III: Chapter 4: Sec. 1- 5, pages 205 - 218.
   Unit V: Chapter 7: Sec. 7.1 - 7.7, pages 289 - 315.
2. Narayanan, S., & Pillay, T.K.M. (2002). *Ancillary Mathematics Book II*, S. Viswanathan Pvt. Ltd.
   Unit IV: Chapter 3: Sec. 1-4, pages: 42 - 60.

Books for Reference:

1. Venkatraman, M. K. (1996). *Engineering Mathematics.* National Publishing Company.
2. Narayanan, S., & Pillay, T.K. M (2009). *Differential Equations and its applications.* S.Viswanathan Pvt. Ltd.
3. Narayanan, S., & Pillay, T.K.M. (2009). *Calculus Volume I & II.* S. Viswanathan Pvt. Ltd,

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Acquire knowledge in integration, differential equations and Laplace Transform.	**K1**
CO2	Understand the various methods of integration, differential equations and the concepts of Laplace transform.	**K2**
CO3	Solve problems in integration, differential equations and Laplace transform	**K3**
CO4	Identify the suitable methods to solve problems related to integration, Differential equations and Laplace transform.	**K4**
CO5	Evaluate integrals, first and second order differential equations with constant coefficients, problems involving Laplace transforms and Ordinary differential equations using Laplace transform.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
2	**25UCH23AC02**			**Allied Course - 2:** Mathematics for Chemistry - 2					**6**	**4**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	3	3	2	2	1	**2.2**
CO2	3	3	2	1	2	3	3	2	1	2	**2.2**
CO3	2	3	2	2	2	2	3	2	2	2	**2.2**
CO4	3	3	2	2	1	3	3	2	2	1	**2.2**
CO5	3	3	1	3	1	3	3	1	3	1	**2.2**
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UHE24AE02	**Ability Enhancement Compulsory Course - 2:** Environmental Studies	2	1

Course Objectives
To enable students connect themselves with nature
To Impart knowledge of the concept of Biodiversity
To create awareness of the causes and consequences of various pollution
To help them recognize the available natural resources and the need to sustain them
To enable them to Identify the environmental problems and offer alternatives by making interventions both individually and collectively

UNIT I: Introduction To Environmental Studies (6 Hours)

Introduction -Subsystems of Earth - Scope and Importance - Various Recycling Methods - Environmental Movements in India – Eco- Feminism - Public awareness - Suggestions to conserve environment

UNIT II: Natural Resources (6 Hours)

Introduction - Food Resources - Land Resources - Forest resources - Mineral Resources - Water Resources - Energy Resources

UNIT III: Ecosystems, Biodiversity and Conservation (6 Hours)

Kinds of Ecosystem - General structure of ecosystem - Functions of Ecosystem - Energy flow and Ecological pyramids - Levels of Biodiversity - Biodiversity at Global Level- Hot spots of Biodiversity - Endangered and Endemic Species - Value of Biodiversity - Threats to Biodiversity - Conservation of Biodiversity

UNIT IV: Environmental Pollution (6 Hours)

Air Pollution - Water Pollution - Oil Pollution - Soil Pollution - Marine Pollution - Noise Pollution - Thermal Pollution - Radiation Pollution

UNIT V: Environmental Organizations and Treatise (6 Hours)

United Nations Environment Program (UNEP) - International treaties on Environmental protection - Ministry of Environment, Forest and Climate Change - Important National Environmental Acts and rules- Environmental Impact assessment

Teaching Methodology	Power point and Field visit
Assessment Methods	Seminar, Group Discussion.

Books for Study:

Department of Human Excellence, (2021). *Environmental Studies.*

Books for Reference:

1. Rathor, V.S. & Rathor B. S. (2013). *Management of Natural Resources for Sustainable Development*. Daya Publishing House.
2. Sharma P.D. (2010). *Ecology and Environment*, (8th Ed.). Rastogi Publications.
3. Agrawal, A &Gibson, C.C. (2001). *Introduction: The Role of Community in Natural Resource Conservation.* Rutgers University Press.

Websites and eLearning Sources

1. https://www.unep.org/
2. http://moef.gov.in/en/
3. https://www.ipcc.ch/reports/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Identify the concepts related to global ecology and the environment	**K1**
CO2	Comprehend the natural resources and environmental organizations	**K2**
CO3	Apply the acquired knowledge to sensitize individuals and public about the environmental crisis	**K3**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
2	**25UHE24AE02**		**Ability Enhancement Compulsory Course - 2:** Environmental Studies							**2**	**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	1	2	2	3	2	2	2	2	**2.1**
CO2	3	2	1	2	2	3	2	2	2	2	**2.1**
CO3	3	2	2	2	2	2	3	2	1	2	**2.1**
										Mean Overall Score	**2.1 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UHE24VE02	**Value Education - 2:** Fundamentals of Human Rights	2	1

Course Objectives
To sensitize students about various human rights and their importance
To empower them with the right understanding of human rights
To enable them to understand the Fundamental rights and the duties in the constitution of India
To help them comprehend the background, principles and the articles of UDHR
To make them involved in activities to defend human rights

UNIT I: Human Rights - An Introduction (6 Hours)

Introduction- Classification of Human Rights- Scope of Human Rights-Characteristics of Human Rights - Challenges for Human Rights in the 21st Century.

UNIT II: Historical Development of Human Rights (6 Hours)

Human Rights in Pre-World War Era- Human Rights in Post-World War Era- Evolution of International Human Rights Law - the General Assembly Proclamation- Institution Building, Implementation and the Post- Cold War Period. The ICC.

UNIT III: India and Human Rights (6 Hours)

Introduction-Preamble to Indian Constitution - Classification of Fundamental Rights-Salient Features of Fundamental Rights-and Fundamental Duties.

UNIT IV: Human Rights of Women and Children (6 Hours)

Women's Human Rights- Issues related to women's rights - and Rights of Women's and Children

UNIT V: Human Rights Violations and Organizations (6 Hours)

Human Rights Violations - Human Rights Violations in India - the Human Rights Watch Report - Human Rights Organizations - NHRC - SHRC.

Teaching Methodology	Power point, Handouts and Group discussion
Assessment Methods	Seminars, Group Discussion, Assignments.

Books for Study:

1. Department of Human Excellence, (2021). *Techniques of Social Analysis: Fundamentals of Human Rights.*

Books for Reference:

1. Venkatachalem. (2005). The *Constitution of India, Giri Law House.*
2. Naik, V. &Shany, M. (2011). *Human rights education and training*, Crescent Publishing Corporation.
3. Neera, B. (2011). *Human Rights Content and Extent.* Swastika Publications.

Websites and eLearning Sources:

1. https://www.un.org/en/universal-declaration-human-rights/
2. https://www.ilo.org/global/lang--en/
3. https://www.amnesty.org/en/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Identify the importance and the values of human rights	**K1**
CO2	Understand the historical background and the development of Human Rights and the related organizations	**K2**
CO3	Apply the provisions of National and International human rights to themselves and the society	**K3**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
2	**25UHE24VE02**			**Value Education - 2:** Fundamentals of Human Rights					**2**		**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	1	2	2	3	2	2	2	2	**2.1**
CO2	3	2	1	2	2	3	2	2	2	2	**2.1**
CO3	3	2	2	2	2	2	3	2	1	2	**2.1**
Mean Overall Score											**2.1 (Medium)**

Scheme of Valuation

Inorganic Qualitative Analysis

INTERNAL

CIA	**100 Marks**
Cumulative mark of Regular Practical Classes	50 Marks
Two CIA tests	50 Marks

For Each CIA Test	**100 marks**
Theory/Test	10 Marks
Record	10 Marks
Procedure	20 marks
Results/Analysis	60 Marks

Scheme of valuation

15 marks for each of the four radicals – 4 × 15 = 60 marks

10 marks for identification of group only of a particular radical

EXTERNAL

Total	**100 Marks**
Theory	10 Marks
Procedure	10 Marks
Results/Analysis	80 Marks

Scheme of valuation

20 marks for each of the four radicals – 4 × 20 = 80 marks

15 marks for Identification of group only of a particular radical

Semester	Course Code	Title of the Course	Hours/ Week	Credits
3	25UTA31GL03	பொதுத்தமிழ் – 3: General Tamil - 3	4	3

கற்றலின் நோக்கங்கள் (Course Objectives)
சங்க இலக்கியங்களின் இன்றியமையாமையை அறிந்து கொள்ளுதல்
இலக்கியத்தினை நுட்பமாக அறிதலின் வழியாக ஆற்றுப்படுத்தும் திறன் பெறுதல்
இலக்கிய அறநெறிகளைத் தற்கால வாழ்வியலில் பயன்படுத்தும் திறன் பெறுதல்
திணை, துறைகளைப் பகுத்தாராயும் அறிவு பெறுதல்
இலக்கிய இலக்கண நுட்பங்களை வாழ்வியலோடு ஒப்பிடுதல்

அலகு – 1 : **(12 மணி நேரம்)**

குறுந்தொகை: குறிஞ்சித் திணை - பரணர் பாடல் (199), முல்லை - ஔவையார் பாடல் (99), மருதம் - கொல்லிக்கண்ணனார் பாடல் (34), நெய்தல் - கச்சிப்பேட்டு நன்னாகையார் பாடல் (172), பாலை - வெண்பூதி பாடல் (174)

நற்றிணை: குறிஞ்சி - கபிலர் பாடல் (194), முல்லை - இடைக்காடனார் பாடல் (142), மருதம் – உறையூர்க் கதுவாய்ச் சாத்தனார் பாடல் (370), நெய்தல் - அறிவுடைநம்பி பாடல் (15), பாலை - கணக்காயனார் பாடல் (24)

ஐங்குறுநூறு: குறிஞ்சி - அன்னாய் வாழிப் பத்து - அன்னாய் வாழி வேண்டன்னை நம் படப்பை (203), முல்லை - செவிலி கூற்றுப் பத்து - மறியிடைபடுத்த மான்பிணைபோல (401), மருதம் - வேட்கைப் பத்து - வாழி ஆதன் வாழி அவினி (01), நெய்தல் - வெள்ளாங்குருகுப் பத்து - வெள்ளாங் குருகின் பிள்ளை (157), பாலை - உடன்போக்கின் கண் இடைச் சுரத்து உரைத்த பத்து - அறம்புரி அருமறை நவின்ற (387)

புறநானூறு: பிசிராந்தையார் (67), அரிசில் கிழார் (146), காக்கைப்பாடினி (278), அள்ளூர் நன்முல்லையார் (306), பரணர் (352)

அலகு – 2 : **(12 மணி நேரம்)**

சிறுபாணாற்றுப்படை

இலக்கணம் - யாப்பு

அலகு – 3 : **(12 மணி நேரம்)**

கலித்தொகை: குறிஞ்சிக்கலி – திருந்திழாய்! கேளாய் எனத் தொடங்கும் பாடல் (64), முல்லைக்கலி – கண் அகன் இரு விசும்பில் எனத் தொடங்கும் பாடல் (101), மருதக்கலி - நறவினை வரைந்தார்க்கும் எனத் தொடங்கும் பாடல் (98), நெய்தல்கலி - இவர்திமில் எறிதிரை எனத் தொடங்கும் பாடல் (135) பாலைக்கலி - அறனின்றி அயல்தூற்றும் எனத் தொடங்கும் பாடல் (2)

பதிற்றுப்பத்து: குமட்டூர்க் கண்ணனாரின் புண் உமிழ் குருதி (11), பாலைக் கௌதமனாரின் கயிறு குறு முகவை (22)

இலக்கிய வரலாறு: சங்க இலக்கியங்கள், சங்க இலக்கியங்களின் தனித்தன்மைகள்

அலகு – 4 : **(12 மணி நேரம்)**

அகநானூறு: அளிநிலை பொறாது அமரிய முகத்தள் எனத் தொடங்கும் பாடல் (5) , திதலை மாமை தளிர்வனப்பு எனத் தொடங்கும் பாடல் (135), திருந்துஇழை நெகிழ்ந்து எனத் தொடங்கும் பாடல் (387)

தனிப்பாடல் திரட்டு:- பிறவிக் குணமும் பழக்கமும் (196), கொடியது (242), பெரியது (244), அரியது (245), இதுவே நலம் (223)

இலக்கிய வரலாறு: பதினெண்கீழ்க்கணக்கு நூல்கள்

அலகு – 5 : **(12 மணி நேரம்)**

திருக்குறள்: இனியவை கூறல் (10), நட்பு ஆராய்தல் (80)

பழமொழி நானூறு: ஆற்றவும் கற்றார் அறிவுடையார் எனத் தொடங்கும் பாடல் (40), வைத்தனை வைப்பென்று எனத் தொடங்கும் பாடல் (95), உடைப்பெருஞ் செல்வத்து எனத் தொடங்கும் பாடல் (154), தத்தமக்குக் கொண்ட எனத் தொடங்கும் பாடல் (276), நோக்கி அறிகல்லா எனத் தொடங்கும் பாடல் (337)

இனியவை நாற்பது:- முதல் பத்து பாடல்கள் (1-10)

இலக்கணம் - அணி

நாடகம் - விந்தனின் வாழப்பிறந்தவன்

கற்பித்தல் அணுகுமுறை (Teaching Methodology)	**விரிவுரை** (Lecture), **காணொளிக் காட்சி** (Videos), **விளக்கக் காட்சி** (PPT presentation)
மதிப்பீட்டு முறைகள் (Assesment methods)	**கருத்துரை**(Seminar), **குழுக் கலந்துரையாடல்** (Group Discussion), **உடனடித்தேர்வு** (Snap Test), **ஒப்படைவு** (Assignment)

பாடநூல்:

1. பொதுத்தமிழ்-3(2025), தமிழாய்வுத்துறை, தூய வளனார் கல்லூரி

பார்வை நூல்கள்:

1. சுப்பிரமணியன். ச. வே (உ.ஆ.), (2003), சங்க இலக்கியம் , கோவிலூர் மடாலயம்

2. கன்னியப்பன்.சிவ (உ.ஆ.), (2004),தனிப்பாடல் திரட்டு, முல்லை நிலையம்

Websites and eLearning Sources:

- *https://learnsangamtamil.com/*
- *https://www.tamilvu.org/library/*

Course Outcomes		
CO No.	***CO-Statements*** **இப்பாடத்தின் நிறைவில் மாணவர்கள்**	***Cognitive Levels (K-Level)***
CO1	சங்க இலக்கியத்தின் தனித்தன்மைகளை அறிவர்	***K1***
CO2	ஆற்றுப்படை இலக்கியங்களைக் கற்பதன் வழி ஆற்றுப்படுத்தும் முறையை இனங்காண்பர்	***K2***
CO3	இலக்கிய நெறிகளை நடப்பியலில் பயன்படுத்துவர்	***K3***
CO4	திணை துறைகளை நன்கு கற்பதன் வாயிலாகப் பாடல்களைப் பகுப்பாய்வர்	***K4***
CO5	யாப்பு, அணியைக் கற்பதன் வாயிலாகப் புதிய இலக்கிய வடிவங்களைப் படைக்கும் திறன் பெறுவர்.	***K5***

Relationship Matrix												
Semester	***Course Code***			***Title of the Course***							***Hours***	***Credits***
3	***25UTA31GL03***			பொதுத்தமிழ் – *3: General Tamil - 3*							***4***	***3***
Course Outcomes	***Programme Outcomes (POs)***					***Programme Specific Outcomes (PSOs)***					***Mean Score of COs***	
	PO1	***PO2***	***PO3***	***PO4***	***PO5***	***PSO1***	***PSO2***	***PSO3***	***PSO4***	***PSO5***		
CO1	*1*	*2*	*2*	*2*	*1*	*3*	*3*	*2*	*3*	*2*	*2.1*	
CO2	*3*	*2*	*1*	*3*	*2*	*3*	*2*	*2*	*3*	*1*	*2.2*	
CO3	*3*	*2*	*1*	*3*	*2*	*3*	*2*	*2*	*3*	*2*	*2.3*	
CO4	*1*	*3*	*2*	*1*	*2*	*3*	*2*	*2*	*2*	*3*	*2.1*	
CO5	*2*	*3*	*2*	*2*	*1*	*3*	*2*	*2*	*2*	*2*	*2.1*	
										Mean Overall Score	***2.16 (High)***	

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UFR31GL03	Language French – 3	4	3

Course Objectives	
1	Remember and Construct Narratives applying the *passé composé* with time indicators to recount past events
2	Understand and express personal memories using the *imparfait* in spoken and written communication to articulate likes, dislikes, and past events.
3	Analyze and interpret different housing options and engage in role-play scenarios to negotiate effectively.
4	Describe physical appearance and personality traits using appropriate adjectives, possessives, and comparatives to describe oneself
5	Evaluate future possibilities in science and communication, expressing hopes and possibilities using the *futur simple* and *conditionnel*

UNIT – I **(12 Hours)**

1. Titre - Nouvelles vies
2. Lexique – Parcours de vie, la vie personnelle, scolaire et professionnelle
3. Grammaire – le passé composé -formation, la phrase négative, les indicateurs de temps
4. Production orale- exprimer son intention de faire quelque chose
5. Production écrite - organiser une activité de loisir

UNIT – II **(12 Hours)**

6. Titre - Je me souviens
7. Lexique – le souvenir : la mémoire, les paysages : à la mer, à la montagne
8. Grammaire – l'imparfait -formation, les pronoms 'y' et 'en', la place de l'adjectif
9. Production orale- exprimer le fait d'aimer et de ne pas aimer
10. Production écrite - raconter un souvenir

UNIT – III **(12 Hours)**

11. Titre - Comme à la maison
12. Lexique – le logement et la location, les frais et les services, le cadre de vie
13. Grammaire – les pronoms relatifs, la comparaison, la condition
14. Production orale- jeu de rôle – louer un logement
15. Production écrite - Décrire un logement

UNIT – IV **(12 Hours)**

16. Titre - Tous pareils, tous différents
17. Lexique – l'apparence physique, les traits de caractère
18. Grammaire – les adjectifs indéfinis, les pronoms possessifs, la comparaison
19. Production orale- faire un compliment
20. Production écrite - faire le portrait physique de quelqu'un

UNIT – V **(12 Hours)**

21. Titre - En route vers le futur
22. Lexique – les sciences et les techniques, les technologies de communication
23. Grammaire – le futur simple, la condition avec 'si', le pronom 'on'
24. Production orale- exprimer un espoir – imaginer à l'avenir
25. Production écrite - Décrire l'utilité d'un objet
26. Indian knowledge system - Analyzing narrative structures in Indian epics vs. French literature by comparing the Mahabharata's moral stories especially the Panchatantra stories to French fables. Practicing French future tense by making simple predictions about personal life by referencing Indian astrology (5%)

Teaching Methodology	Project-Based Chronological Learning (PBL), Digital Media Integration, Genre-Specific Writing Approach, Scenario-based learning (SBL)
Assessment Methods	*Podcast creation:* Students record a short podcast episode on "Childhood Memory". (Rubric – assessed on ability to construct narratives using past tenses and expressing experiences. *Debate:* Debate on "Apartment vs. House: Students must compare housing options, rental costs, and services. (Rubric – evaluated on analytical skills through structured argumentation) *Timeline narrative activity:* Create a timeline about "A Typical College Day" (Rubric – Assessed on the ability to recall and construct a chronological narrative using past) *Letter writing:* Write a letter to a friend describing personal experiences. Write a formal inquiry to a landlord about an apartment (Rubric – Assessed on formal and informal written communication skills)

Books for Study:

1. Fafa, C., Gajdosova, F., Horquin, A., Pasquet, A., Perrard, M., Petitmengin, V., Sperandio, C., Dodin, M., &Veldeman-Abry, J. (2022). *Édito A2: Méthode de français* (2nd ed.). Didier FLE, Hatier. (p.13 – p.77)

Books for Reference:

1. Dauda, P., Giachino, L., &Baracco, C. (2016). *Génération A2*. Didier.
2. Girardet, J., &Pecheur, J. (2017). *Écho A2* (2nd ed.). CLE International

Websites and eLearning Sources:

1. https://www.bbc.co.uk/bitesize/subjects/zc7xpv4
2. https://conjuguemos.com/
3. https://www.busuu.com/en/course/learn-french-online
4. https://www.duolingo.com/learn
5. https://www.newsinslowfrench.com/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Recall using vocabulary related to personal, academic, and professional life, and compose narratives using the *passé composé* and time indicators.	**K1**
CO2	Express experiences and preferences using *imparfait*to recount memories, express likes and dislikes accurately in spoken and written communication.	**K2**
CO3	Comparedifferent housing options and interpret rental-related expenses and services, and engage in role-play scenarios to negotiate accommodations.	**K3**
CO4	Characterise personal traits by describing physical appearance and personality traits, apply possessive and indefinite adjectives, and formulate comparisons effectively.	**K4**
CO5	Discuss advancements in science and communication, express hopes and possibilities using the *futur simple* and *conditionnel*structures.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
3	**25UFR31GL03**		Language French – 3						**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	2	3	1	3	3	3	2.5
CO2	3	2	3	3	1	2	2	2	2	2	2.2
CO3	3	1	3	3	2	2	2	2	1	1	2.0
CO4	2	2	2	2	2	1	2	1	1	1	1.6
CO5	2	3	3	2	2	2	3	3	3	3	2.6
Mean Overall Score											**2.18 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UHI31GL03	Language Hindi - 3	4	3

Course Objectives
To appreciate the features of Modern Hindi Prose
To understand the Hindi literature in association with the contemporary requirements
To enable the students to develop their effective communicative skills in Hindi
To strengthen the language competence among the students
To empower the students with globally employable soft skills

UNIT I **(12 Hours)**

1. Tera Sneh na Khovoom
2. Samband Bodak
3. Reethikal - Namakarn
4. Chitra Varnan (Basic)

UNIT II **(12 Hours)**

5. Paribakshik Shabdavali
6. Smuchaya Bodak
7. Reethikal - Samajik Paristhithiya
8. Vachan Badalo

UNIT III **(12 Hours)**

9. Vismayadi Bodak
10. Reethikal - Sahithyik Paristhithiyam
11. Beerbal ki Chadurai
12. Patra-Patrikao mein Prakashit Gadyansho ka Patan (Basic)

UNIT IV **(12 Hours)**

13. Avikary Shabdh
14. Reethikal - Main Divisions
15. Ling Badalo
16. Karak

UNIT V **(12 Hours)**

17. Reethikal - Visheshathayem
18. Anuvad
19. Bahu Ki Vidha (One Act Play)
20. Bathcheeth - Kaksha mein

Teaching Methodology	Videos, PPT, Quiz, Group Discussion, Case Based Problem Solving
Assessment Methods	Quiz, Seminar, Assignment

Books for Study:

1. Dr. Sanjeev Kumar Jain. (2023). *Anuwad: Siddhant Evam Vyavhar*. Kailash Pustak Sadan.
2. Kamathaprasad Gupth, M. (2021). *Hindi Vyakaran*, Anand Prakashan.
3. Dr. Sadananth Bosalae. (2020). *kavya sarang*. Rajkamal Prakashan.

Books for Reference:

1. Ramdev. (2021). *Vyakaran Pradeep*. Hindi Bhavan.
2. Lakshman Prasad Singh. (2022). *Kavya Ke Sopan*. Bharathy Bhavan Prakashan.
3. Acharya Ramchandra Shukla. (2021). *Hindi Sahitya Ka Itihas*, Prabhat Prakashan.
4. Krishnakumar Gosamy. (2023). *Anuvad vigyan ki Bhumika*. Rajkamal Prakashan.

Websites and eLearning Sources:

1. https://www.hindwi.org/poets/jaishankar-prasad/all
2. https://youtu.be/e9wK-pYfVPc

3. https://www.amarujala.com/kavya/sahitya/sumitranandan-pant-best-hindi-poems
4. https://mycoaching.in/samuchchay-bodhak-kya-hai
5. https://www.subhshiv.in/2021/06/avikari-shabd.html

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of the course, the student will acquire thelisted skills	
CO1	Categorize the poetics in some selective poems.	**K1**
CO2	Practical application of grammar.	**K2**
CO3	Justify the social & political conditions of Riti Kaal in Hindi Literature.	**K3**
CO4	Find out the dialects of Hindi language.	**K4**
CO5	Illustrate the importance given to family ethics by the youth in the modern period according to "Bahoo Ki vidha" One Act play.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
3	**25UHI31GL03**	Language Hindi - 3								**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	3	2	3	2	1	3	2	2.4
CO2	3	2	3	2	2	3	2	3	2	3	2.5
CO3	3	2	2	3	1	3	2	3	2	3	2.4
CO4	2	3	3	2	3	2	3	3	2	1	2.4
CO5	3	2	2	3	3	2	1	3	2	3	2.4
Mean Overall Score											**2.42 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25USA31GL03	Language Sanskrit - 3	4	3

Course Objectives
To introduce simple poetry in Sanskrit
To give an exposure to the Vedas and Vedangas
To acquaint students with epics and puranas
To train students in conjugation of verbs in future tense
To introduce Upasarga-s and their role in verb formations

UNIT I **(12 Hours)**

Ramodantam, Balakandam (1-15 verses)

UNIT II **(12 Hours)**

Ramodantam, Balakandam (15-30 verses)

UNIT III **(12 Hours)**

Vedas – Vedangas vivaranam

UNIT IV **(12 Hours)**

Asta dasha Purana and Dashopanishads

UNIT V **(12 Hours)**

Upasargas and Bhavishyat Kaalah Vakya Prayoga

Teaching Methodology	Videos, PPT, Blackboard, Demonstration, Exercises
Assessment Methods	Seminar, Quiz, Group Discussion.

Books for Study:

1. VEDIC LITERATURE
2. RAMODANTAM

Books for Reference:

1. Parameshwara, Ramodantam, LIFCO Chennai 2020
2. R. S. Vadhyar & Sons, Book – sellers and publishers, Kalpathu, Palaghat – 678003, Kerala, south India, History of Sanskrit Literature 2021
3. Kulapathy, K.M Saral Sanskrit Balabodh, Bharathita vidya bhavan, Munshimarg Mumbai – 400 007 2020

Websites and eLearning Sources:

1. https://www.scribd.com/doc/210917188/Sri-Ramodantam-Sanskrit-Text-With-English-Translation
2. http://www.sushmajee.com/ms-ppp/text/ved-notes.pdf
3. https://occr.org.in/publication/Vedanga.pdf
4. https://www.forgottenbooks.com/en/download/TheThirteenPrincipalUpanishadsTranslatedFromtheSanskrit_10017247.pdf
5. https://www.learnsanskrit.org/guide/uninflected-words/the-upasarga/

Course Outcomes		
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO1	Remember Characters and events of Ramayana	**K1**
CO2	Understand social ethics and moral duties.	**K2**
CO3	Apply the values learnt, in day-to-day life	**K3**
CO4	Appreciate the Vedic Philosophy	**K4**
CO5	Evaluate and create new words with upasargas	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**25USA31GL03**			Language Sanskrit - 3					**4**		**3**
Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	2	2	3	3	3	3	3	2	1	2.3
CO2	3	3	2	3	3	2	2	3	3	3	2.7
CO3	3	3	1	3	3	1	1	3	3	3	2.4
CO4	2	2	1	2	3	2	2	3	2	1	2.0
CO5	3	3	2	3	2	2	3	3	3	2	2.6
Mean Overall Score											**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
3	25UEN32GE03B	**General English - 3:** English for Science - 1	5	3

Course Objectives
To enable the students to comprehend the local and global issues through the lessons.
To enable the students to do the tasks centering on Skill Development and Grammar.
To empower the students with interactive skills.
To enhance their taste for reading that will naturally develop their vocabulary power and sentence structures
To develop the listening, speaking and writing skills of students through the prescribed texts.

UNIT I: Encounter Between Humans and Aliens (15 Hours)

1. "They're Made Out of Meat" by Terry Bisson
2. Vocabulary in Context: Meat Words
3. Writing: Informal Letter Writing
4. Speaking: Role Play
5. Grammar: Present Perfect Tense

UNIT II: Life After Death (15 Hours)

6. "The Egg" by Andy Weir
7. Vocabulary in Context: Cide Words
8. Writing: Formal Letter Writing
9. Speaking: Description of a Picture
10. Grammar: Present Perfect Continuous Tense

UNIT III: In Communion with Nature (15 Hours)

11. "A Tiger in the House" by Ruskin Bond
12. Vocabulary in Context: Animals and their babies
13. Writing: Job Application Writing (Writing Covering Letter and Curriculum Vitae)
14. Speaking: Description of an Advertisement
15. Grammar: Past Perfect Tense

UNIT IV: Mystery of Venus (15 Hours)

16. "All Summer in a Day" by Ray Bradbury
17. Vocabulary in Context: Rain Words
18. Writing: Drafting Invitation and Brochure
19. Speaking: Short Academic Presentation
20. Grammar; Past Perfect Continuous

UNIT V: Think Before You Trash (15 Hours)

21. "My Frog Recycles All His Trash" by Kenn Nesbitt
22. Vocabulary in Context: Ecological Words
23. Writing: Preparing an Advertisement
24. Speaking: Welcome Address and Vote of Thanks
25. Grammar: Future Perfect Tense and Future Perfect Continuous Tense

* Speaking Components are meant only for internal tests

Teaching Methodology	Lecture, Multimedia Presentations, Discussion and Enacting
Assessment Methods	Speaking, reading, listening and written tests

Books for Study:

1. Francis, V., Dr. D.R. Edwin Christy and Dr. D. Loyola Innaci. *Lingua Science – I*, St. Joseph's College (Autonomous), Tiruchirappalli.

Books for Reference:

1. Wilfred, D. Best. *Students Companion*. HarperCollins Publishers, 2020.

2. Wren & Martin. *Middle School English Grammar and Composition,* S Chand Publishing, 2023.
3. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*, Rupa Classics, 2013.

Websites and eLearning Sources:

1. https://jerrywbrown.com/wp-content/uploads/2020/02/They-are-made-out-of-meat-Bisson-Terry.pdf
2. https://www.are.na/block/12921440
3. https://pdfcoffee.com/andy-weir-the-egg-pdf-pdf-free.html
4. https://mrsdelcarmen.weebly.com/uploads/3/0/9/0/30908551/a_tiger_in_the_house_by_ruskin_bond.pdf
5. https://poetry4kids.com/poems/my-frog-recycles-all-his-trash/
6. https://www.stcypriansprimaryacademy.co.uk/wp-content/uploads/2021/01/All-Summer-in-a-Day-by-Ray-Bradbury.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Identify and comprehend the local and global issues through the lessons	**K1**
CO2	Use interactive skills	**K2**
CO3	Develop the Listening and Reading Skills of the learners through teacher-led reading practice	**K3**
CO4	Enhance their Listening, Reading, Speaking, and Writing Skills	**K4**
CO5	Develop their Creative and Critical Thinking and Speaking Skills	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UEN32GE03B**			**General English - 3:** English for Science - 1						**5**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	3	2	3	2	3	2	2.4
CO2	2	2	3	2	3	3	2	3	2	2	2.3
CO3	2	3	2	3	2	2	3	2	3	2	2.4
CO4	2	2	3	2	3	3	2	3	2	3	2.5
CO5	2	2	2	3	2	2	2	3	2	2	2.2
									Mean Overall Score		**2.36 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UCH33CC04	**Core Course - 4:** General Chemistry - 3	4	3

Course Objectives
To explore the properties and chemical behaviour of Group-13 elements, emphasizing their structural and industrial applications.
To develop an in-depth understanding of the synthesis and reactions of alkanes and alkenes, along with their mechanistic pathways and stereochemistry.
To analyze and apply the Second Law of Thermodynamics to various chemical reactions and physical processes.
To provide a fundamental understanding of thermodynamic principles, laws governing solutions and their applications in real and ideal gas systems.
To cultivate an in-depth comprehension of advanced thermodynamic laws elucidating their role in energy transformations.

UNIT I: Group-13 Elements (12 Hours)

Occurrence and extraction - Oxidation and types of bonds – relativistic effect (or inert-pair effect) - General characteristics – melting and boiling points, sizes of atoms and ions, electropositive character, ionization energy - Thermite reaction - Structure, properties and importance of compounds of group 13 elements – Alums, boron sesquioxide, boric acid, structures of borates, borax, alumina, aluminates, halides, complexes, diborane and other higher boron hydrides, boron nitride, borazine, zintl phases.

UNIT II: Alkanes (12 Hours)

IUPAC nomenclature of alkanes – petroleum source of alkanes – octane number – preparation of alkanes using Grignard and Gilmann reagents – Wurtz synthesis – chlorination and bromination of alkanes – mechanism of free radical substitution – factors determining product distribution – reactivity and selectivity principle – radical substitution in benzylic and allylic carbons – stereochemistry of radical substitution reactions.

UNIT III: Alkenes (12 Hours)

Methods of preparation of alkenes – dehydrohalogenation of alkyl halides – regioselectivity – dehydration of alcohols – Saytzeff's rule, relative stability of alkenes – dehalogenation of vicinal dihalides – elimination mechanisms (E1, E2) – Hoffman elimination and its regioselectivity – reduction of alkynes – *cis/trans* alkene formation, Witting reaction.

Electrophilic addition – general mechanism – addition of HX – regioselectivity – Markovnikov's and Anti–Markovnikov's rules – carbocation stability –Addition of bromine and its stereochemistry – addition of water (oxymercuration–demercuration, hydroboration–oxidation) – addition of hydrogen– ozonolysis.

UNIT IV: Thermodynamics-I (12 Hours)

Internal energy, work, heat, and energy-molecular interpretation of heat and work and internal energy- First Law-work-general expression for work- expansion against constant pressure-reversible expansion – isothermal reversible expansion-enthalpy-enthalpy change and heat transfer-variation of enthalpy with temperature-heat capacity at constant pressure and volume–Quantifying w, *q, dU* and *dH* during the reversible and irreversible processes of expansion of ideal and real gases under isothermal and adiabatic conditions-Joule-Thomson effect- relationship between μJT and other thermodynamic quantities-calculation of Joule-Thomson coefficient for ideal and real gases-inversion temperature-zeroth law of thermodynamics- absolute scale of temperature.

UNIT V: Thermodynamics -II (12 Hours)

Second law of thermodynamics-entropy-entropy as a state function-Carnot cycle-Clausius inequality-entropy changes accompanying specific processes : expansion, phase transitions, heating, measurement of entropy –third law- Nernst heat theorem-third law entropies- Helmholtz and Gibbs energies-criteria of spontaneity- maximum work-standard Gibbs energies of reaction-standard Gibbs energies of formation-Born equation – Maxwell relations-variation of internal energy with volume-properties of the Gibbs energy-variation of the Gibbs energy with temperature and pressure.

Teaching Methodology	Videos, Molecular models, PPT &Chalk and talk
Assessment Methods	Snap test, Open book test, Seminar, Assignment, GD & MCQ

Books for Study:

1. Lee, J. D. (1996). *Concise Inorganic Chemistry* (5th Ed.). Blackwell Science Ltd.
2. Morrison, R. T., & Boyd, R. N. (2011). Organic Chemistry (7th Ed.). Allyn and Bacon Ltd.
2. Bruice, P. Y. (2011). Organic Chemistry (8th Ed.). Pearson.
3. Laidler, K. J., & Meiser, J. H. (2006). *Physical Chemistry* (2nd Ed.). CBS Publishers & Distributors.
4. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). Principles of Physical Chemistry (49th Ed.). Shoban Lal Nagin Chand & Co.

Books for Reference:

1. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry* (5th Ed.). Pearson Education.
2. Housecroft, C. E., & Sharpe, A. G. (2012). *Inorganic Chemistry* (4th Ed.). Pearson Education.
3. Pine, S. H. (1986). *Organic Chemistry* (4th Ed.). McGraw-Hill International Book Company.
4. Finar, I. L. (1996). *Organic Chemistry* (Vols. 1 & 2, 6th Ed.). Addison Wesley Longman Ltd.
5. McQuarrie, D. A., & Simon, J. D. (2004). *Molecular Thermodynamics*. University Science Books.
6. Castellan, G. W. (2004). *Physical Chemistry* (4th Ed.). Narosa.
7. Atkins, P. W., & de Paula, J. (2006). Atkins' Physical Chemistry (8thEd.). Oxford University Press.

Websites and eLearning Sources:

1. Inert pair effect | The p-block elements | Inorganic Chemistry | Khan Academy
2. Khan Academy - Organic Chemistry Reactions
3. Markovnikov's Rule | Anti-Markovnikov's Rule | Mechanism
4. https://phys.libretexts.org/Bookshelves/University_Physics/University_Physics_%28OpenStax%29/University_Physics_II_-_Thermodynamics_Electricity_and_Magnetism_%28OpenStax%29/03%3A_The_First_Law_of_Thermodynamics/3.04%3A_First_Law_of_Thermodynamics?utm_source=chatgpt.com
5. https://onlinecourses.swayam2.ac.in/nou22_me01/preview

Inert-pair effect Organic reactions

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recall fundamental concepts of thermodynamics, hydrocarbons, and Group-13 elements.	**K1**
CO2	Explain key thermodynamic principles and organic reaction mechanisms with a clear understanding of theoretical concepts.	**K2**
CO3	Apply thermodynamic laws, laws governing solutions and organic reaction mechanisms to analyze chemical behaviors and predict outcomes.	**K3**
CO4	Acquire proficiency in thermodynamic concepts and analyze the behavior of gases under different thermodynamic conditions.	**K4**
CO5	Analyze thermodynamic principles, Group-13 elements and organic reaction mechanisms to construct complex systems.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UCH33CC04**			**Core Course - 4:** General Chemistry - 3						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	1	2	3	2	1	3	**2.2**
CO2	2	3	2	3	2	1	3	2	2	3	**2.3**
CO3	3	3	3	2	2	3	2	1	3	2	**2.4**
CO4	3	2	2	3	3	2	1	2	3	2	**2.3**
CO5	2	3	2	3	3	3	2	2	1	3	**2.5**
Mean Overall Score											**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UCH33CC05	**Core Course - 5:** General Chemistry - 4	4	3

Course Objectives
To understand the general characteristics of group-14 elements
To describe the comparative study on hydrides, halides and oxides of nitrogen group elements
To illustrate the preparation and chemical reactions of dienes and alkynes
To analyse the mechanism, evidences and stereochemistry of S_N1, S_N2 and S_Ni reactions
To evaluate the applications of buffer buffers in analytical chemistry and biochemical processes

UNIT I: Group-14 Elements (12 Hours)

Occurrence and extraction - Differences between carbon, silicon and the remaining elements - General characteristics – covalent radii, ionization energy, melting points, metallic and non-metallic character, allotropy of carbon, oxidation states - Structure, properties and importance of compounds of group-14 elements – carbides, oxides of carbon and silicon, silicates, silicones, halides (stannous chloride).

UNIT II: Group-15 Elements (12 Hours)

General characteristics- A comparative study on hydrides, halides and oxides of nitrogen group elements. Structure and basic character of ammonia. Oxyacids of nitrogen (HNO_2, HNO_3) and phosphorous (H_3PO_3, H_3PO_4 and $H_4P_2O_7$). Preparation, properties and structure of hydrazine

UNIT III: Dienes and Alkynes (12 Hours)

Dienes: Nomenclature and Classification of Dienes, Conformations of dienes – Reactions of isolated and conjugated dienes –Thermodynamic Vs Kinetic control, 1,4-Addition reactions-Diels-Alder reaction, Exo and Endo products.

Alkynes: Nomenclature, Preparation of alkynes – Addition of HX, H_2O, BH_3, reductions of alkynes (Addition of Hydrogen), acidity of terminal alkynes – electrophilic addition to alkynes – ozonolysis of alkynes.

UNIT IV: Substitution Reactions of Alkyl Halides (12 Hours)

Nucleophilic substitution mechanisms – S_N2–Factors affecting S_N2 reactions: leaving group – nucleophilicity – basicity and nucleophilicity, effects of solvents and steric effect on nucleophilicity – reversibility of S_N2 reactions –mechanism of S_N1 reaction –factors affecting S_N1 reactions–leaving group – nucleophile – carbocation rearrangement – stereochemistry of S_N2 and S_N1 reactions –Walden inversion – racemization in S_N1 reactions – competition between S_N2 and S_N1 reactions – competition between substitution and elimination– S_N2/E2 conditions – S_N1/E1 conditions – substitution and elimination reactions in synthesis – S_Ni reaction – example and mechanism.

UNIT V: Thermochemistry (12 Hours)

Change of internal energy and enthalpy in chemical reactions-exothermic and endothermic reactions-relation between enthalpy of a reaction at constant volume and constant pressure-standard enthalpies of reactions, combustion, neutralization, solution, formation-determination of enthalpies of reactions-Kirchhoff equation-Hess's law-bomb calorimeter bond energy and its applications.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Lee J D, (1996). *Concise Inorganic Chemistry*, (5th Ed.). Blackwell Science Ltd, Oxford, London.
   Unit- I *Chapter 13*
   Unit- I *Chapter 1*
2. Bruice P Y, (2011). *Organic Chemistry*, (8th Ed.). Pearson Ltd., University of California, Santa Barbara.
   Unit- III *Chapters 7& 8*
   Unit- IV Chapter 9
3. Morrison R T and Boyd R T, (2011). *Organic Chemistry*, (8th Ed.). Allyn and Bacon Ltd., New York.
   Unit-II *Chapter 11*

4. Keith J. Laidler, John H. Meiser, (2006). *Physical Chemistry*, (2nd Ed.). CBS Publishers & Distributors, New Delhi. Unit-V
5. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). Principles of Physical Chemistry (49th Ed.). Shoban Lal Nagin Chand & Co.

Books for Reference:

1. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry* (5th Ed.). Pearson Education.
2. Housecroft, C. E., & Sharpe, A. G. (2012). *Inorganic Chemistry* (4th Ed.). Pearson Education.
3. Pine, S. H. (1986). *Organic Chemistry* (4th Ed.). McGraw–Hill International Book Company.
4. Atkins, P.W., & Paula, J. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=63pSwsTJCbs
2. https://www.youtube.com/watch?v=d-2UQa3-ta8
3. https://www.youtube.com/watch?v=unn8QVxC3A8&list=PLuY17MjLpWBUnJOPparKwQjp92n-7zRJS
4. https://www.youtube.com/watch?v=7OTJ7qP0kgU

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand the structure, properties and importance of compounds of group-14 elements	**K1**
CO2	Explain the general characteristics of group-15 elements	**K2**
CO3	Demonstrate the general preparation and chemical properties of alkynes	**K3**
CO4	Analyze the mechanism and stereo chemical evidences of nucleophilic substitution reactions	**K4**
CO5	Examine the degree of dissociation of electrolytes and the factors affecting it.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UCH33CC05**			**Core Course - 5:** General Chemistry - 4						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	1	2	3	2	3	1	2	3	2	**2.1**
CO2	3	1	2	2	3	3	2	1	3	2	**2.2**
CO3	2	2	1	3	2	2	1	2	3	2	**2.0**
CO4	3	3	2	1	2	2	2	3	2	2	**2.2**
CO5	3	2	2	3	3	2	3	2	2	3	**2.5**
										Mean Overall Score	**2.2(High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UCH33CP03	**Core Practical - 3:** Physical Chemistry Practical - 1	3	2

Course Objectives
To prepare solutions of different concentrations
To recognize the principles of CST, chemical kinetics, conductance and potentiometry
To learn how to prepare solutions of different concentration
To apply the knowledge of conductometry and potentiometry to different titrations
To experiment the principles of conductometry and potentiometry in acid - base, precipitation and redox titrations

UNIT I **(9 Hours)**

Theory of the practical's - critical solution temperature - transition temperature - heat of neutralization - kinetics of ester hydrolysis and persulfate oxidation - viscosity - polarimetry of inversion of sugar - potentiometry - conductometry - calculation of parameters with units - drawing graphs - handling of various equipment used in physical chemistry practical.

UNIT II **(9 Hours)**

1. Critical Solution Temperature for Phenol - Water system
2. Heat of Neutralization
3. Determination of Viscosity of liquids

UNIT III **(9 Hours)**

1. Transition temperature of a salt hydrate
2. Kinetics of acid catalyzed hydrolysis of an ester
3. Kinetics of inversion of sugar

UNIT IV **(9 Hours)**

1. Conductometric Acid-Base Titration
2. Determination of cell constant, specific conductance and equivalent conductance of strong electrolyte.

UNIT V **(9 Hours)**

1. Potentiometric Acid - Base Titration
2. Determination of solubility product of a sparingly soluble substance by potentiometric titration

Teaching Methodology	chalk and talk, laboratory demonstrations
Assessment Methods	Viva Voce, Experiment evaluation, test

Books for Study:

1. *Lab Manual*. Department of Chemistry. St. Joseph's College (Autonomous), Trichy
2. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry*, (2nd Ed.). Sultan Chand & Sons.
3. Daniels, Mathews, F., Howard, J., & John Warren, W. (1970). *Experimental Physical Chemistry*, (7th Ed.). Mc Graw Hill.
4. Findlay, A. (1959). *Practical Physical Chemistry*, (7th Ed.). Longman.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=avO1K7lfTXI
2. https://www.youtube.com/watch?v=FD9ljxjYIjw
3. https://www.youtube.com/watch?v=68bo-h3Kf7s
4. https://www.youtube.com/watch?v=V2844r79cMw
5. https://www.youtube.com/watch?v=nvBaDAPAWAU

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Describe the theoretical concepts while performing experiments.	**K1**
CO2	Acquire practical skill to estimate the strength of acid and base by conductometric method	**K2**
CO3	Learn the effective usage of chemicals.	**K3**
CO4	Acknowledge experimental errors and their possible sources.	**K4**
CO5	Design, carry out, record and analyze the results of chemical experiments	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**25UCH33CP03**			**Core Practical - 3:** Physical Chemistry Practical - 1					**3**		**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	1	2	3	4	2	3	2	3	3	**2.4**
CO2	2	3	4	3	4	2	1	3	4	3	**2.9**
CO3	1	3	1	4	3	2	2	3	3	1	**2.3**
CO4	2	3	2	3	2	2	3	2	1	4	**2.4**
CO5	3	4	3	3	2	2	3	1	2	3	**2.6**
										Mean Overall Score	**2.5 (High)**

Scheme for valuation
Core Practical-3: Physical Chemistry Practical–1
(PHYSICAL CHEMISTRY-1)

INTERNAL

CIA	**100 Marks**
Cumulative mark of Regular Practical Classes	50 Marks
Two CIA tests	50 Marks
For Each CIA Test	***100 marks***
Theory/Test	10 Marks
Record	10 Marks
Principle & short procedure	10 marks
Calculation & Tabulation	10 marks
Graph	10
Results	50 Marks

Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

EXTERNAL

Total	**100 Marks**
Theory/Test	10 Marks
Record	10 Marks
Principle & short procedure	10 marks
Calculation & Tabulation	10 marks
Graph	10
Results	50 Marks

Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UCH33AO01A	**Allied Optional - 1:** Physics - 1	4	3

Course Objectives
To acquire the knowledge behind the sound waves, the basics of electricity and magnetism, properties of liquids and solids and optical instruments.
To understand the different types of sound waves, different properties of solids, liquids and entropy for different thermodynamic process.
To classify and discuss the types of voltages and currents, working of different optical devices and different defects.
To calculate acoustical, elastic constants, viscosity, surface tension, refractive index and to apply the concepts of kinetic theory of gases and liquefaction of gases in real cases.
To categorize the types of motion and modes of sound waves, bending of beams, thermodynamics process and to analyze the effect of electric and magnetic fields in conductors, the dispersion, deviation and defects in optics.

UNIT I: Waves and Oscillations (12 Hours)

Simple harmonic motion and circular motion - composition of two simple harmonic motions at right angles (periods in the ratio 1:1) - Lissajous figures - uses - Laws of transverse vibrations of strings - verification of Melde's string - transverse and longitudinal modes - determination of A.C. frequency using sonometer (steel and brass wires) - Ultrasonics - production - application and uses - Acoustics of buildings - reverberation - Absorption coefficient - Requirements for a good auditorium.

UNIT II: Properties of Matter (12 Hours)

Elasticity: Elastic constants - energy stored in a stretched wire - bending of beams - expression for bending moment - Young's modulus by non-uniform bending - torsion in a wire - determination of rigidity modulus by torsional pendulum.

Viscosity: Streamline flow and turbulent flow- Coefficient of viscosity - Poissuelle's formula - Comparison of Viscosities - burette method - Stoke's law - terminal velocity - viscosity of highly viscous liquids.

Surface tension: Molecular theory of surface tension - excess pressure inside a drop and bubble - variation of surface tension with temperature.

UNIT III: Thermal Physics (12 Hours)

Postulates of kinetic theory of gases - Joule-Kelvin effect - Porous plug experiment - theory of Porous plug Experiment - Liquefaction of gases - Linde's process - adiabatic demagnetization - Helium I and II - Thermodynamic equilibrium - laws of thermodynamics - entropy - change of entropy in reversible and irreversible processes.

UNIT IV: Electricity and Magnetism (12 Hours)

Capacitor - energy of charged capacitors - loss of energy due to sharing of charges - Biot - Savart's law - magnetic induction at a point on the axis of a circular coil carrying current - EMF induced in a coil rotating in a magnetic field - Mean value of alternating current - RMS values of a ac current and voltage- Electric circuit - switch and its types - fuses - circuit breaker - Relays - P.O. Box: measurement of resistance - Potentiometer: calibration of ammeter.

UNIT V: Geometrical Optics (12 Hours)

Refraction - Normal refraction - Refractive index by microscopy - air cell method - refraction through a prism and thin prism - Spectrometer - determination of refractive index - combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion - direct vision spectroscope - defects of images - coma, Distortion -Aberrations - spherical aberration in lenses - methods of minimizing spherical aberration - Chromatic aberration in lenses - Expression for longitudinal chromatic aberrations.

Teaching Methodology	Chalk and Talk, Demo Videos, PPT, Hand-outs
Assessment Methods	Seminar, Snap Test, MCQ, Online Quiz, Assignment

Books for Study:

1. Murugesan, R. (2015), *Allied Physics* (Reprint), S Chand and Co. Publications.

Unit	Book	Chapter	Section
I	1	1	1.1, 1.3, 1.4, 1.7,1.8, 1.9, 1.10, 1.11, 1.12,1.13, 1.14, 1.15, 1.16, 1.17
II	1	2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.12, 2.13, 2.14, 2.15, 2.17, 2.19, 2.20, 2.21, 2.22, 2.24, 2.25, 2.27, 2.28, 2.30
III	1	3	3.1, 3.4, 3.5, 3.6, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.15, 3.16, 3.17, 3.18, 3.20, 3.21, 3.22
IV	1	4	4.1, 4.2, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, 4.12, 4.16, 4.17, 4.18, 4.19, 4.20
V	1	5	5.1, 5.2, 5.3, 5.5, 5.6, 5.10, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.22, 5.23, 5.24

Books for Reference:

1. Halliday. D, Resnick. R, & Walker. J (2010). *Fundamental of Physics*, (9th Ed.). John Wiley & Sons.
2. Schaltz, M.E (2011). *Grob's Basic Electronics* (11th Ed.). McGraw Hill.
3. Mathur, D.S (2016). *Elements of Properties of Matter (Reprint*). S. Chand and Co. Publications.
4. Garg, S.G., Bansal, R.M., & Gosh, C.K. (2012). *Thermal Physics*. Tata-McGraw Hill Publications.

Websites and eLearning Sources:

1. https://archive.nptel.ac.in/courses/115/106/115106119/
2. https://archive.nptel.ac.in/courses/112/105/112105183/
3. https://archive.nptel.ac.in/courses/115/105/115105129/
4. https://archive.nptel.ac.in/courses/115/106/115106122/
5. https://archive.nptel.ac.in/courses/115/107/115107131/

(subject to availability - not to be used for exam purpose)*

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Acquire knowledge of physics fundamentals involved in waves, and oscillation, properties of materials, thermal physics, electricity, magnetism and ray optics	**K1**
CO2	Understand the different properties of a physical matter, vibration in strings and sonometer, kinetic theory of gases, electrical circuits, electric, magnetic induced effects and dispersive power of a prism.	**K2**
CO3	Apply the concepts of ray optics and electricity and magnetism, wave oscillations in real life problems like defects in images, aberration in lenses, electrical circuits and acoustics of buildings	**K3**
CO4	Examine the physics knowledge learned from class room with real life problems.	**K4**
CO5	Evaluate the properties of different physics matters, optical phenomena in prism and dynamics of charges.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**25UCH33AO01A**			**Allied Optional - 1:** Physics - 1					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	1	2	3	2	1	2	2	**2.0**
CO2	3	3	2	2	2	3	2	2	2	2	**2.3**
CO3	3	3	2	3	2	3	3	3	2	2	**2.6**
CO4	3	3	2	3	2	3	2	3	2	2	**2.5**
CO5	3	3	2	3	2	3	3	3	2	2	**2.6**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UCH33AO01B	**Allied Optional – 1:** Principles of Electronics	4	3

Course Objectives
Understand the working principles of semiconductor devices, including diodes, BJTs, FETs, MOSFETs, and optoelectronic components such as laser diodes and photodiodes.
Analyze electronic circuits, including linear power supplies, voltage regulators, relays, switch-mode power supplies (SMPS), and UPS systems.
Explore different types of sensors and transducers, including resistive, capacitive, and inductive transducers, and their applications in measuring humidity, flow rate, pH, pressure, and thermal conductivity.
Gain knowledge of integrated sensors and their interfacing techniques, including temperature sensors (LM35), Hall effect sensors, opto-isolators, magnetic field sensors, and wearable sensors.
Simulate analog circuits using PSPICE, covering circuit analysis, worst-case design, DC sweep, transfer function analysis, and controlled sources for practical circuit evaluation.

UNIT I: Semiconductor Devices (12 Hours)

Introduction to semiconductor devices-diode-Bipolar Junction Transistor- Field Effect Transistor-Applications-Metal oxide Semiconductor - Enhancement mode- Depletion mode-MOSFET -Silicon controlled Rectifier- Laser diode- Photo diode-Optocoupler-Applications.

UNIT II: Electronic Circuits (12 Hours)

Introduction to Linear Power supply- Voltage regulators - Relays-types-switching applications using relay-solid state relay - Opto-SCR and Opto-triac based switching for high power applications-Switch mode power supply-Block diagram-Applications- UPS - Capacitive power supply.

UNIT III: Sensors (12 Hours)

Sensors and Transducers - Transducers-Resistive transducers-capacitive transducers- Inductive transducers- LVDT principle and applications. Measurement of non electrical quantity: humidity-flow rate-pH pressure-thermal conductivity.

UNIT IV: Integrated Sensors (12 Hours)

Basic sensor signal conditioning networks for interfacing with PC- Integrated sensors overview-temperature module based on LM35-Hall effect sensor module-TSOP17 photo module-MOC 3042 opto-isolator module-kmz51 magnetic field module- ICM105A VGA CMOS sensor-MPXV5004G pressure sensor- 3 axis accelerometer module: MPU 6050 IMU sensor-wearable sensors.

UNIT V: PSPICE Simulation for Analog Circuits (12 Hours)

Introduction to PSPICE-small circuit simulation-circuit examples for worst case design-DC sweep - plotting output-Sources and polynomially controlled sources- Transfer function analysis (one example).

Teaching Methodology	Demo Videos, Review, PPT, Exercises, circuit simulation
Assessment Method	Circuit design, written assignment, MCQ test, Open book test, snap test

Books for Study:

1. Malvino, A., Bates, D., & Hoppe, P. (2015). *Electronic Principles,* (9th Ed.).
2. Mathivanan, N. (2007). *PC- Based Instrumentation: Concepts and Practice.*
3. Tuinenga, P.W. (2015). *A guide to circuit simulation and Analysis using PSPICE.*

Material Prepared by the Department

Unit	Book	Chapter	Sections
I	1	3,5,6,12	3.1,6.1,6.2,6.3,12.1,12.3,12.4,13.2,5.9
II	1,4	22	22.1,22.7
III	2	3	3.1.3,3.2.2,3.3,3.4,3.5
IV	2,4	3,4	3.1.4, Material prepared by the department
V	3,4	1,2,3,5,6	1.1,1.2.2.1-2.4,3.3,5.1,5.6,5.7

Books for Reference:

1. Mottershead, A. (1979). *Electronic Devices and Circuits.*
2. Sinclair, I. (2000). *Sensors and Transducers.*
3. Rahid. (2005). *Introduction to PSPICE using ORCAD for Circuits and Electronics.*

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc23_ma94/preview

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Classify and interpret the semiconductor devices	**K1**
CO2	Demonstrate and analyze the functionalities of various electronic circuits	**K2**
CO3	Distinguish and evaluate various sensors	**K3**
CO4	Compare and estimate the operations of integrated sensors	**K4**
CO5	Design and develop electronic circuits for different applications	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UCH33AO01B**			**Allied Optional – 1:** Principles of Electronics						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	1	2	2	2	3	3	2	2	**2.1**
CO2	3	3	2	3	2	3	3	3	2	2	**2.6**
CO3	2	3	2	2	2	3	2	3	2	3	**2.4**
CO4	3	3	2	3	2	3	3	2	2	3	**2.6**
CO5	3	3	2	3	2	3	3	2	2	3	**2.6**
										Mean Overall Score	**2.5 (High)**

SCHEME OF VALUATION

INTERNAL

CIA 100 Marks

Cumulative mark of regular practical classes 40 Marks
Record 10 Marks
Two CIA tests 50 Marks

For Each CIA Test 100 marks
Test 10 Marks
Results 90 Marks
Scheme of valuation
volumetry
<5% Error 30 Marks
10% 20 Marks
>10% 10 Marks

EXTERNAL
Total 100 Marks
Viva voce 10 Marks
Results 90 Marks (volumetry)
Scheme of valuation
<5% Error 30 Marks
10% 20 Marks
>10% 10 Marks

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UHE34VE03A	**Value Education - 3:** Social Ethics - 1	2	1

Course Objectives
To gain a comprehensive understanding of the principles advocated in social ethics.
To examine the different types of political systems in a thorough manner.
To comprehend the role and obligations of the educated youth.
To evaluate the conduct of the elected representatives in a detailed manner.
To thoughtfully analyze the various forms of cyber-crime.

UNIT I: Introduction to Social Ethics (6 Hours)

Social ethics, social ethics and social responsibility, social ethics play an important role on the areas, religion influences social changes and vice versa, secularism. Social ethics and corporate dynamics, forms of social ethics.

UNIT II: The Economic and Political System of Today (6 Hours)

Planned economy and communism - market economy and capitalism- socialism - mixed economy -the emerging market economy - political system- totalitarian system- oligarchic system.

UNIT III: Integrity in Public Life National Integration (6 Hours)

What is Integrity, Public Life, Integrity and Public Life, Integrity in a Democratic State, India as Democratic State, Behavior of a elected representative of India, Noticeable degradation acts of elected Representatives, Suggestions to stem this rot, Types of integrity, Transparency can be a guarantee for integrity.

UNIT IV: Cyber Crime (6 Hours)

Business Ethics, Business ethics permeates the whole organization, measuring business ethics, The Vital factors highlighting the importance of business ethics, Cyber-crime, Strategies in committing Cyber Crimes, Factors aiding Cyber Crime, computer Hacking, Cyber Bullying, Telecommunications piracy, Counter Measures to Cyber Crime, Ethical Hacking.

UNIT V: Social Integration (6 Hours)

Global challenges, the future is with the Educational Youth, Cost of the Sacrifice, Crusaders against corruption, Responsibility of the Educated Youth, Positive Global Scenario, right to Education, Eradicating gender inequality, Sustainable Human Development, Social Integration, Elimination Crime, Integration with Global Market

Teaching Methodology	Lecture, PPT, Power point
Assessment Methods	Online Test, Group Discussions

Books for Study:

1. Department of Human Excellence. (2021). *Formation of Youth*, St Joseph's College (Autonomous), Tiruchirappalli.

Books for Reference:

1. Arora, R.K. (2014). *Ethics, Integrity and Values*. Public Service Paperback.
2. Cunningham, D. (2004). *There's something happening here: The new left, the Klan, and FBI counterintelligence*. Berkeley: University of California Press.
3. Mali, P. (2017). *Cyber law & Cyber Crimes simplified*. Cyber Info Media Paperback.
4. Richardson, M. (2019). *Cyber Crime: Law and Practice Hardcover - Import*.

Websites and eLearning Sources:

1. https://cybercrime.gov.in/
2. https://open.lib.umn.edu/sociology/chapter/14-2-types-of-political-systems/
3. https://www.esv.org/resources/esv-global-study-bible/social-ethics/
4. https://en.wikipedia.org/wiki/Political_system

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Know the responsibility of the educated youth.	**K1**
CO2	Understand the values prescribed under social ethics.	**K2**
CO3	Apply their minds critically to the various types of cyber-crime.	**K3**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours/Week**		**Credits**
3	**25UHE34VE03A**		**Value Education - 3:** Social Ethics - 1						**2**		**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	2	2	3	3	**2.7**
CO2	3	2	2	2	3	2	2	3	2	2	**2.3**
CO3	2	3	3	3	2	3	3	3	3	3	**2.8**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UHE34VE03B	**Value Education - 3:** Religious Doctrine - 1	2	1

Course Objectives
To impart knowledge to students about Salvation History
To familiarize students with the life and mission of Jesus Christ
To help Students understand the Holy Spirit
To empower students on Gospel Values
To equip the students about Mother Mary

UNIT I **(6 Hours)**

God of salvation

UNIT II **(6 Hours)**

Life & Mission of Jesus Christ

UNIT III **(6 Hours)**

The Holy Spirit

UNIT IV **(6 Hours)**

Gospel Values

UNIT V **(6 Hours)**

Mary, the mother of God

Teaching Methodology	Power point, Assignment and Group discussion
Assessment Methods	Online Test, Group Discussions

Books for Study:

1. Department of Human Excellence. (2022). *Fullness of Life.* St. Joseph's College, Tiruchirappalli.

Books for Reference:

1. (1994). *Compendium: Catechism of the Catholic Church.* Bengaluru: Theological Publications in India.
2. Holy Bible (NRSV).

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Understand the Salvation History	**K1**
CO2	Grasp to the life and purpose of Jesus Christ	**K2**
CO3	Live out the teachings of the Gospel	**K3**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours/Week**		**Credits**
3	**25UHE34VE03B**			**Value Education - 3:** Religious Doctrine - 1					**2**		**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	2	2	3	3	**2.7**
CO2	3	2	2	2	3	3	3	3	2	2	**2.5**
CO3	2	2	3	3	2	2	3	3	3	3	**2.6**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25USS34SE01	**Skill Enhancement Course - 1:** Soft Skills	2	1

Course Objectives
To help students understand, practice, and improve their communication skills
To enable students with effective presentation skills
To help students attend interviews confidently and participate effectively in group discussions
To make students realise their potential and excel on personal as well as professional grounds
To develop the thinking skills of students for better performance in competitive exams, interviews and u discussions

UNIT I Communication Skills (6 Hours)

Basics of Communication: Importance of Good Communication Skills, Types of Communication Skills, Verbal Communication, Non-verbal Communication, Tips for Improving Nonverbal Communication, Communication Styles, Barriers to Communication, Ways To Improve Communication Skills, Practicum. *Professional Grooming*: How to Create the Impact for that First Impression, Presentation Skills, Developing Handouts, Developing Notes, Adding Visual and Audio Effects, Practicum

UNIT II Resume Writing & Interview Skills (6 Hours)

*Resume Writing***:** The Purpose of a Resume, Finding a Job & Making a Career, Length of Resume, Order of Resume, Tailoring the Resume, What your Resume should include, Some Tips for Listing a Bachelor's degree on Your Resume, What NOT to put on your Resume, Formatting Resume, Difference between Resume, Biodata and Curriculum Vitae, Preparation of a Resume *Interview Skills***:** Meaning of Interview, Types of Interviews, How to get ready for the big day?, Appropriate Attire, Etiquette, Mastering the Art of Meet and Greet, Resume - Points to Remember, Practicum *Group Discussion:* Why is GD Essential?, Factors that influence GD, Outcome of GD, Tips for participation in a GD, Useful phrases for GD, Success Tips in GD, Practicum.

UNIT III Personal Effectiveness (6 Hours)

Self-Discovery: Characteristics of Personality, Kinds of Self, Who am I?, Personality Inventory Table *Goal Setting*: Why do Goal Setting?, Goal Setting Process, Smart Goals

UNIT IV Numerical Ability (6 Hours)

Average, Simple Interest, Compound Interest, Profit and Loss, Area, Volume and Surface Area

UNIT V (6 Hours)

Verbal Reasoning: Series Completion, Analogy. *Non-Verbal Reasoning.*

Teaching Methodology	Chart, PPT, chalk and talk, Video Presentation

Books for Study:

1. Balaiah, J., & Joy, J. L. (2024). Straight from the Traits: Securing Soft Skills, (Revised 3rd Ed.). St. Joseph's College, Tiruchirappalli.

Books for Reference:

1. Aggarwal, R.S. (2010). A Modern Approach to Verbal and Non-Verbal Reasoning, S. Chand.
2. Balaiah, J. & Joy, J. L. (2018). Winners in the Making: A primer on soft skills. St. Joseph's College, Tiruchirappalli.
3. Covey S. R. (2004). The 7 Habits of Highly Effective People: Restoring the Character Ethic (Rev. ed.). Free Press.
4. Egan, G. (1994). The Skilled Helper (5th Ed.). Pacific Grove, Brooks/Cole.
5. Khera, S. (2014). You Can Win. Macmillan Books.
6. Martin, Y. (2005). Hiring the Best: A Manager 's Guide to Effective Interviewing and Recruiting, (5th Ed.). Adams Media.
7. Sankaran, K., & Kumar, M. (2010). Group Discussion and Public Speaking, (5th Ed.). M.I. Publishers.
8. Trishna. (2012). How to do well in GDS & Interviews, (3rd Ed.). Pearson Education.

Websites and eLearning Sources:

1. https://www.indeed.com/career-advice/resumes-cover-letters/communication-skills
2. https://www.seek.com.au/career-advice/article/50-communication-skills-for-the-workplace-your-resume
3. https://southeast.iu.edu/career/files/power-phrases.pdf
4. https://dese.ade.arkansas.gov/Files/20201209124449_Professional-Communication.docx
5. https://www.dol.gov/sites/dolgov/files/ETA/publications/00-wes.pdf
6. https://www.tmu.ac.in/other_websites/cdoe.tmu.ac.in.old/study-material/28-08-2024/COMMON/SEMESTER_2/MAIN_SOFT_SKILLS.pdf
7. https://byjus.com/maths/profit-and-loss-questions/
8. https://www.indiabix.com/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Analyse problems directed at testing their cognitive abilities	**K1**
CO2	Present the best of themselves as job seekers and communicate effectively in all contexts	**K2**
CO3	Assess themselves, set goals, and manage conflicts that are expected of a good leader	**K3**
CO4	Enhance numerical ability required for the employees for various transactions	**K4**
CO5	Develop aptitude skills required by the employers	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25USS34SE01**			**Skill Enhancement Course - 1:** Soft Skills						**2**	**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	2	2	2	3	2	3	2.5
CO2	2	3	3	2	3	3	2	3	2	2	2.5
CO3	2	2	3	3	2	3	3	3	2	2	2.5
CO4	2	2	3	3	2	3	3	3	2	2	2.5
CO5	2	2	3	3	2	3	3	3	2	2	2.5
Mean Overall Score											**2.5 (High)**

SCHEME OF VALUATION

INTERNAL

CIA 100 Marks

Cumulative mark of regular practical classes 40 Marks
Record 10 Marks
Two CIA tests 50 Marks

For Each CIA Test 100 marks
Test 10 Marks
Results 90 Marks
Scheme of valuation
volumetry
<5% Error 30 Marks
10% 20 Marks
>10% 10 Marks

EXTERNAL

Total 100 Marks
Viva voce 10 Marks
Results 90 Marks (volumetry)
Scheme of valuation
<5% Error 30 Marks
10% 20 Marks
>10% 10 Marks

Semester	Course Code	Title of the Course	Hours	Credits
4	25UTA41GL04B	General Tamil – 4: அறிவியல் தமிழ் (Scientific Tamil)	4	3

கற்றலின் நோக்கங்கள் (Course Objectives)
அன்றாட வாழ்வில் அறிவியலின் செல்வாக்கை அறிந்துகொள்ளுதல்
பண்டைத்தமிழர் வாழ்வில் இடம்பெற்ற அறிவியல்கூறுகளைக் கண்டறிதல்
திரைப்படம், நூல் போன்றவற்றைத் திறனாய்வு நோக்கில் ஆராய்தல்
தமிழர்தம் பண்பாடும் அறிவியலும் கொண்ட தொடர்பைப் புலப்படுத்துதல்
படைப்பாற்றல் திறனைக் கண்டறிந்து அறிவியல் படைப்புகளை உருவாக்கல்

அலகு - 1 **(12 மணி நேரம்)**

கணிதவியல்: பார்ப்பார்க்கு அல்லது பணிபு அறியலையே(பதிற்றுப்பத்து : 63) - விசும்பில் ஊழி - ஊழ்-ஊழ் செல்லக் (பரிபாடல் : திருமால் : 4-15) - கண்ணுங்கால் கண்ணும் கணிதமே (சிறுபஞ்சமூலம் :92) - உண்ணாது வைக்கும் பெரும்பொருள் (இன்னா நாற்பது -16)

உயிரியல்: தொல்காப்பியம் : மரபியல் : (27-33) - சிறுவீ ஞாழல் (நற்றிணை 195) - நீடுவெயில் உழந்த (அகநானூறு 335) - வள் இதழ் ஒண் செங்காந்தள் (குறிஞ்சிப்பாட்டு 61-98) -வாள்வரி வயமான் (அகநானூறு 99) -புல்லாகிப் பூடாய்ப் புழுவாய் மரமாகிப் (திருவாசகம்- சிவபுராணம் 26-32

உரைநடைக்கட்டுரை: வியக்க வைக்கும் தமிழரின் அறிவியல்

பயன்முறை கற்றல்: வலைப்பூக்கள் உருவாக்கம்- அறிவியல்கலைச்சொல்லாக்கம்

அலகு - 2 **(12 மணி நேரம்)**

நீரியல்: அம்ம வாழி தோழி (குறுந்தொகை 287) -அம்ம வாழி, தோழி கைம்மிக (அகம் 141: 1-11) -முழங்கு முந்நீர் முழுவதும் வளைஇப் (புறநானூறு-18) -வீங்கு விளிம்பு உரீஇய விசை அமை நோன் சிலை (அகநானூறு-175) -விசும்பு ஆடு பறவை வீழ் பதிப் படர (குறிஞ்சிப்பாட்டு 46-53)- **திருக்குறள்** வான்சிறப்பு - **பதார்த்த சிந்தாமணி :** குளத்து சலந்தானே கொடிதான (27) - ஏரிசலம் வாதமிகு மதுவே (31) -அருவிநீர் மேக மகற்நுங் (39)

ஆழிப்பேரலை: வாழ்க எம் கோ மன்னவர் (சிலப்பதிகாரம் -காடுகாண் காதை15-22)- தீங்கனி நாவல் ஓங்கும்இத் தீவிடை (மணிமேகலை-பீடிகை கண்டு பிறப்புணரந்த காதை (17-22)

உரைநடைக்கட்டுரை: தமிழர்களின் மருத்துவ அறிவியல்

புதினம்: இரா. நடராசன் : சர்க்கஸ்.காம்

அலகு - 3 **(12 மணி நேரம்)**

உலகியல்: நிலம் தீ நீர் வளி விசும்போடு (தொல்.பொருள் 635) - நிலம் நீர் வளி விசும்பு என்ற நான்கின் (பதிற்று 14:1-4) - மண் திணித்த நிலனும் (புறம் 2 1-6)

வானியல் : செஞ்ஞா யிற்றுச் செலவும் (புறம் 30 1-7) - ஆடு இயல் அழல் குட்டத்து புறநானூறு (229) - நெடுவயின் ஒளிறு மின்னுப் பரந்தாங்கு (பதிற்று 24:1-26)

உரைநடைக்கட்டுரை: தமிழ் இலக்கியங்களில் வெளிப்படும் நீர் மேலாண்மையியல்

பயன்முறை கற்றல்: நூல் – திறனாய்வு

அலகு - 4 **(12 மணி நேரம்)**

மருத்துவம்: திருக்குறள்: மருந்து - இரும்பனம் புடையல் ஈகை வான்கழல் (பதிற்றுப்பத்து -42) – ஏற்றி இறக்கி இருகாலும் பூரிக்கும் – (திருமந்திரம் 571) - இல்லையே வாதம் எழில்நடை கோழியாம் (கர்ப்ப வாகடத் திரட்டு-23)

அணு இயற்பியல்: மணிமேகலை : சமயக் கணக்கர் தந்திறங் கேட்ட காதை (105-165) - மேவிய சீவன் வடிவது சொல்லிடில் (திருமந்திரம் –ஏழாம் தந்திரம் 29:1) - அணுவில் அணுவினை ஆதிபிரானை (திருமந்திரம் –ஏழாம் தந்திரம் 28:2) - அண்டப் பகுதியின் உண்டைப் பிறக்கம் (திருவாசகம்- திருவண்டப் பகுதி 106) - அண்டங்கள் எல்லாம் அணுவாக (திருவிளையாடல் புராணம் –அணுவியல் (பாயிரம்-6) - செகத்தையெல்லாம் அணுவளவுஞ் சிதறா வண்ணஞ் (தாயுமானவர் – தந்தை தாய் 6)

உரைநடைக்கட்டுரை: தமிழில் அறிவியல் புனைவுகள்

பயன்முறை கற்றல்: திரைப்படத் திறனாய்வு- ஆவணப் படத்திறனாய்வு

அலகு - 5 **(12 மணி நேரம்)**

கட்டடவியல்: வானம் ஊன்றிய மதலை போல (பெரும்பாண் : 346-351) - விரி கதிர் பரப்பிய வியல் வாய் மண்டிலம் (நெடுநல்வாடை 72-88) - காடுகொன்று நாடாக்கி (பட்டினப்பாலை 283-288) - பெருக்காறு சடைக்கணிந்த பெருமான் சேரும் (தேவாரம் 2801)

பகுத்தறிவியல்: ஓசை உள்ள கல்லை (சிவவாக்கியர் -412)- நட்டகல்லைத் தெய்வமென்று (சிவவாக்கியர்-482)

உரைநடைக்கட்டுரை: அறிவியல் தமிழின் வளர்ச்சி நிலைகள்;

பயன்முறை கற்றல்: பழமொழிகளில் அறிவியல், மூலிகைகளைக் கண்டறிதல்

கற்பித்தல் அணுகுமுறை *(Teaching Methodology)*	விரிவுரை ***(Lecture),*** காணொளிக் காட்சி ***(Videos),*** விளக்கக் காட்சி ***(PPT presentation)***
மதிப்பீட்டு முறைகள் *(Assesment methods)*	வலைப்பூ உருவாக்கம், திரைப்படத் திறனாய்வு, மூலிகை சேகரிப்பு, நூல் திறனாய்வு

பாட நூல்கள்:

1. தமிழாய்வுத்துறை (2025), அறிவியல் தமிழ், தூய வளனார் தன்னாட்சிக் கல்லூரி
2. இரா.நடராசன்; (2010), சர்க்கஸ்.காம், Books for Children
3. மூர்த்தி அ.கி. (2001), அறிவியல் கலைச்சொல் அகராதி, மணிவாசகர் பதிப்பகம்.

பார்வை நூல்கள்:

1. அரிமாப்பாமகன் . ஆ (2017), சங்க இலக்கியத்தில் சூழலியல், இராசகுணா பதிப்பகம்
2. குழந்தைசாமி.வா.செ., (2001), அறிவியல்தமிழ், பாரதி பதிப்பகம்

Websites and eLearning Sources:

- https://www.tamilcomputingjournal.org/?page_id=2622
- https://archive.org/details/dli.jZY9lup2kZl6TuXGlZQdjZl3lMyy
- https://thamizhiyal.com/?p=2775
- https://www.valaitamil.com/jan-month-Article_19160.html

Course Outcomes

CO No	***CO–Statements*** **இப்பாடத்தின் நிறைவில் மாணவர்கள்**	***Cognitive Levels (K –Levels)***
CO -1	அன்றாட வாழ்வில் அறிவியலின் செல்வாக்கை அறிந்துகொள்வர்	***K1***
CO -2	பண்டைத்தமிழர் வாழ்வில் இடம்பெற்ற அறிவியல்கூறுகளைக் கண்டறிவர்	***K2***
CO -3	திரைப்படம், நூல் போன்றவற்றைத் திறனாய்வு நோக்கில் ஆராய்வர்	***K3***
CO -4	தமிழர்தம் பண்பாடும் அறிவியலும் கொண்ட தொடர்பைப் புலப்படுத்துவர்	***K4***
CO -5	படைப்பாற்றல் திறனைக் கண்டறிந்து அறிவியல் படைப்புகளை உருவாக்கும் திறன் பெறுவர்	***K5***

Relationship Matrix											
Semester	***Course Code***			***Title of the Course***						***Hours***	***Credits***
4	***25UTA41GL04B***			*General Tamil – 4: அறிவியல் தமிழ் (Scientific Tamil)*						***4***	***3***
Course Outcomes↓	***Programme Outcomes (PO)***					***Programme Specific Outcomes (PSO)***					***Mean Scores of COs***
	PO-1	***PO-2***	***PO-3***	***PO-4***	***PO-5***	***PSO-1***	***PSO-2***	***PSO-3***	***PSO-4***	***PSO-5***	
CO-1	*3*	*2*	*3*	*2*	*2*	*3*	*3*	*2*	*2*	*2*	*2.4*
CO-2	*2*	*3*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*2.5*
CO-3	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*3*	*3*	*3*	*2.7*
CO-4	*2*	*3*	*3*	*2*	*2*	*3*	*2*	*3*	*3*	*2*	*2.5*
CO-5	*3*	*1*	*2*	*3*	*2*	*2*	*3*	*2*	*3*	*3*	*2.4*
										Mean Overall Score	***2.5 (High)***

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UFR41GL04	Language French – 4	4	3

Course Objectives
Express preferences and opinions with precision using quantity expressions, and pronouns to convey satisfaction or dissatisfaction.
Describe Health Conditions and provide medical advice using appropriate grammatical structures to engage in meaningful discussions
Communicate Effectively in Social and Professional Settings by expressing desires and requests and using polite expressions
Exchange Travel Information and construct well-structured narratives to recount journeys
Enhance communication through structured language with contextually appropriate statements across various topics

UNIT – I **(12 Hours)**

1. Titre - En cuisine
2. Lexique – les aliments, la restauration, les goûts et les sensations
3. Grammaire – les quantités et le pronom ‘en’, la restriction ‘ne…que’, l’obligation
4. Production orale- communiquer au restaurant
5. Production écrite - exprimer sa satisfaction et son insatisfaction

UNIT – II **(12 Hours)**

6. Titre - A votre sante
7. Lexique – les corps et la sante, la médecine et les urgences
8. Grammaire – les pronoms COD et COI, le superlatif, les pronoms interrogatifs
9. Production orale- parler des problèmes de santé
10. Production écrite - Donner un conseil pour une condition médicale

UNIT – III **(12 Hours)**

11. Titre - Dans les médias
12. Lexique – les médias audios et les réseaux sociaux
13. Grammaire – la cause et la conséquence, le subjonctif, la place des pronoms
14. Production orale- exprimer son intérêt et sa préférence
15. Production écrite - faire une critique positive et négative

UNIT – IV **(12 Hours)**

16. Titre - Consommer responsable
17. Lexique – la consommation, les catégories de produits, le travail manuel
18. Grammaire – le conditionnel présent – formation et emploi, le gérondif
19. Production orale- demander et proposer un service
20. Production écrite - exprimer un souhait ou un désir

UNIT – V **(12 Hours)**

1. Titre - Envies d’ailleurs
2. Lexique – le voyage, l’hébergement, le séjour, le tourisme
3. Grammaire – le passé composé et l’imparfait dans le récit, les pronoms démonstratifs
4. Production orale- demander des renseignements sur un voyage
5. Production écrite - parler d’une visite touristique
6. Indian knowledge system - Writing travel narratives based on ancient Indian pilgrimage sites and comparing with French monuments. Using French quantity expressions and pronouns to describe Ayurvedic food portions and dietary balance and offering Ayurvedic-based medical advice. (5%)

Teaching Methodology	L'approche communicative (Communicative Language Teaching -CLT), Genre-Based Approach, Experimental learning, Flipped Classroom Approach
Assessment Methods	*Role-Play:* Restaurant Experience: waiter and customer ordering food and expressing opinions on the meal. (Rubric – graded on usage of expressions related to food and grammatical accuracy) *Written assessment:* Write a short critique of a social media platform, movie, or advertisement. (Rubric – assessed on ability to express opinions and logical argumentation) *Travel Blog or Postcard Writing:* Write a blog post or postcard describing a recent travel experience, using descriptive language (Rubric – assessed on structured narrative writing in a travel context and usage of past tenses) *Group Debate:* Media & Society: Debate the impact of social media on education. (Rubric – graded on critical thinking, Argument clarity and participation

Books for Study:

1. Fafa, C., Gajdosova, F., Horquin, A., Pasquet, A., Perrard, M., Petitmengin, V., Sperandio, C., Dodin, M., &Veldeman-Abry, J. (2022). *Édito A2: Méthode de français* (2nd ed.). Didier FLE, Hatier. (p.83 – p.152)

Books for Reference:

1. Dauda, P., Giachino, L., & Baracco, C. (2016). *Génération A2*. Didier.
2. Girardet, J., &Pecheur, J. (2017). *Écho A2* (2nd ed.). CLE International

Websites and eLearning Sources:

1. https://cuisine-facile.com/
2. https://www.france.fr/en/
3. https://www.sncf-connect.com/
4. https://www.routard.com/
5. https://sante.lefigaro.fr/

Course Outcomes		
CO No.	**CO–Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K –Levels)**
CO1	Apply vocabulary related to food by using quantity expressions and pronoun to communicate satisfaction or dissatisfaction in oral and written contexts.	**K1**
CO2	Identify and describe health conditions, construct superlative forms, and formulate medical advice using appropriate grammatical structures.	**K2**
CO3	Express opinions, preferences, and critiques about various media platforms, apply cause-and-consequence structures	**K3**
CO4	Utilize vocabulary related to consumption, express desires and requests effectively in professional and social interactions.	**K4**
CO5	Request and provide travel-related information and describe tourist experiences using demonstrative pronouns and structured narratives.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
4	**25UFR41GL04**			Language French – 4					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	1	2	2	1	3	2	1	2	2	1.8
CO2	2	2	2	3	1	2	2	2	2	2	2.0
CO3	2	3	2	3	3	2	2	3	1	1	2.2
CO4	3	3	3	2	3	3	1	2	2	2	2.4
CO5	3	2	2	3	2	2	2	1	1	2	2.0
Mean Overall Score											**2.08 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	**25UHI41GL04**	Language Hindi - 4	**4**	**3**

Course Objectives
To strengthen the language competence among the students
To equip students with cinematic perspective by comparative studies of Hindi literature
To enable the students to develop their effective communicative skills in Hindi
To strengthen the language competence among the students
To incept research-oriented aspirations among students

UNIT I **(12 Hours)**

1. Prathyay
2. Char Bhai
3. Adhunik Kaal - Introduction
4. Adhunik Kal – Namakarn

UNIT II **(12 Hours)**

5. Chitra Varnan (Advanced)
6. Paryayvachy Shabdh
7. Bathcheeth - Hotel mein
8. Adhunik Kal - Samajik Paristhithiyam

UNIT III **(12 Hours)**

9. Upasarg
10. Thulsi ke Dhoe
11. Apathit Gadyansh
12. Adhunik Kal – Sahithyakar

UNIT IV **(12 Hours)**

13. Review- Book/Film
14. Paryavaran Pradookshan
15. Adhunik Kal - Main Divisions
16. Anuvad

UNIT V **(12 Hours)**

17. Kaal
18. Patra-Patrikao mein Prakashit Gadyansho ka Patan (Advanced)
19. Sapnom Kee Home Delivery (Novel)
20. Adhunik Kal - Visheshathayem

Teaching Methodology	Debate Participation, Videos, PPT, Quiz, Project Work
Assessment Methods	Quiz, Snap Test, Group Discussion

Books for Study:

1. Dr. Sadananth Bosalae. (2022). *kavya sarang*. Rajkamal Prakashan.
2. Kamathaprasad Gupth, M. (2021). *Hindi Vyakaran*. Anand Prakashan.
3. Dr. Sanjeev Kumar Jain. (2022). *Anuwad: Siddhant Evam Vyavhar*. Kailash Pustak Sadan.

Books for Reference:

1. Rajeswar Prasad Chaturvedi. (2021). *Hindi vyakarana*. Upakar Prakashan.
2. Ramdev. (2021). *Vyakaran Pradeep*. Hindi Bhavan.
3. Krishnakumar Gosamy. (2023). *Anuvad vigyan ki Bhumika*. Rajkamal Prakashan.
4. Acharya Ramchandra Shukla. (2021). *Hindi Sahitya Ka Itihas*, Prabhat Prakashan.
5. Mamta Kaliya. (2022). *Sapno Ki Home Delivery*. Lokbharti Prakashan.

Websites and eLearning Sources:

1. https://youtu.be/xmr-DaQ3LhA
2. https://mycoaching.in/adhunik-kaal
3. https://m.sahityakunj.net/entries/view/bhartiya-sahitya-mein-anuvad-kee-bhoomika
4. https://mycoaching.in/upsarg-in-hindi
5. https://kalingaliteraryfestival.com/speakers/mamta-kalia/

Course Outcomes		
CO No.	**CO–Statements** On successful completion of the course, the student will acquire the listed skills.	**Cognitive Levels (K –Levels)**
CO1	List out the social conditions prevailed in Modern Period which are depicted in Hindi Literature.	**K1**
CO2	Discuss the dialects of Hindi language.	**K2**
CO3	Illustrate the works of some eminent Hindi Writers related to society.	**K3**
CO4	Evaluate the film & Literary works in Hindi.	**K4**
CO5	Analyze the human values expressed in life and literature of Hindi Novelist “Mamatha Kaliya”.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours / week**		**Credits**
4	**25UHI41GL04**			Language Hindi – 4					**4**		**3**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	3	2	3	2	3	1	2.4
CO2	3	2	3	3	2	3	2	3	1	2	2.4
CO3	3	2	2	3	2	2	1	3	2	3	2.3
CO4	3	2	3	1	3	3	2	3	3	2	2.5
CO5	3	2	2	3	3	2	3	2	3	3	2.6
									Mean Overall Score		**2.44 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25USA41GL04	Language Sanskrit - 4	4	3

Course Objectives
To give an exposure to Sanskrit drama in general
To showcase the structure of pre-kalidasan plays in Sanskrit
To coach students in Sanskrit morphology
To acquaint students with the structures of Sanskrit syntax
To impart communicative skills in Sanskrit by training in the functional aspects of the language

UNIT I **(12 Hours)**

Samskrita Vyavahara sahasri vakiya Prayogaha

UNIT II **(12 Hours)**

Lot Lakaarah, Prayaogh Kartari Vaakyaani

UNIT III **(12 Hours)**

Naatakasya Itihaasah Vivaranam, Thuva and Tum Suffixs

UNIT IV **(12 Hours)**

Karnabhaaram, Naatakasya Visistyam

UNIT V **(12 Hours)**

Samskrita Racanani Vubhavoga

Teaching Methodology	Videos, PPT, Blackboard, Demonstration, Exercises
Assessment Methods	Seminar, Quiz, Group Discussion.

Books for Study:

1. Karnabhavam & Literature Language
2. Dhaatu Manjari
3. Samskrita Vyavahara Sahasri (A Collection of One Thousand Sentances),Samskrita Bharati, Delhi,2021

Books for Reference:

1. R. S. Vadhyar & Sons, Book – sellers and publishers, Kalpathu, Palghat – 678003, Kerala, south India, History of Sanskrit Literature 2021
2. Kulapathy, K. M Saral Sanskrit Balabodh, Bharathita vidya bhavan, Munshimarg Mumbai – 400 007 2020
3. Samskrita Bharathi, Aksharam 8 th cross, 2nd phase Giri nagar Bangalore Vadatu sanskritam – Samaskara Binduhu 2021

Websites and eLearning Sources:

1. https://sanskritdocuments.org/doc_z_misc_major_works/daily.pdf
2. https://www.learnsanskrit.org/guide/verbs-1/karmani-and-bhave-prayoga/
3. https://ia902903.us.archive.org/7/items/in.ernet.dli.2015.102820/2015.102820.The-Sanskrit-Drama-In-Its-Origin-Development-Theory-And-Practice.pdf
4. https://archive.org/details/oafI_karna-bharam-karnas-burden-of-bhasa-with-dr.-sudhakar-malaviya-gokuldas-sanskrit
5. https://sanskritwisdom.com/composition/essays/sanskrit-language/

Course Outcomes		
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO1	Understand human behaviors by studying dramas	**K1**
CO2	Remember and identifying Mahabharata characters and events	**K2**
CO3	Apply the morals learnt in day-to-day life	**K3**
CO4	Appreciate ancient Sanskrit dramas	**K4**
CO5	Create new conversational sentences and to Improve self-character (Personality Development)	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25USA41GL04**			Language Sanskrit - 4						**4**	**3**
Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	3	3	3	3	3	2	2.4
CO2	2	2	3	3	2	3	2	3	3	2	2.5
CO3	3	3	2	3	2	1	1	3	3	3	2.4
CO4	2	2	3	2	3	3	3	3	2	3	2.6
CO5	2	3	3	3	2	1	3	3	3	2	2.5
Mean Overall Score											**2.48 (High)**

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
4	25UEN42GE04B	**General English - 4:** English for Science - 2	5	3

Course Objectives
To expand vocabulary by learning and using context-specific words.
To improve writing through practice in reports, reviews, and social media posts.
To master grammar by focusing on question tags and subject-verb agreement.
To enhance speaking skills through debates and discussions.
To appreciate literature and science to boost creative thinking.

UNIT I: Simple Ways to Explore Nature **(15 Hours)**

1. "Marie Curie Biographical" Taken from The Nobel Prize
2. Vocabulary in Context: Radioactive Elements
3. Writing: Media Reports
4. Speaking: Expansion of a Proverb
5. Grammar: Question Tag

UNIT II: The Limits of Human Knowledge **(15 Hours)**

1. "The Marry Month of May" by O. Henry
2. Vocabulary in Context: Seasonal Words
3. Writing: Book or Film Review
4. Speaking: Debate
5. Grammar: WH Questions

UNIT III: Difference Between Original and Copy **(15 Hours)**

1. "The story of Dolly the sheep" taken from Natural World, Science and Technology, Scotland
2. Vocabulary in Context: Cloning Words
3. Writing: E-mail Etiquette
4. Speaking: Group Discussion
5. Grammar: Yes or No Questions

UNIT IV: The Other Worlds **(15 Hours)**

1. "The Star" by Arthur C. Clarke
2. Vocabulary in Context: Astronomical Words
3. Writing: Writing for Social Media (Blogs, Twitter, Instagram and Facebook)
4. Speaking: Story Telling
5. Grammar: Conditional Sentences

UNIT V: Scientific Temparament **(15 Hours)**

1. "The Particle Dance" by Emily Dickinson
2. Vocabulary in Context: Scientific Instruments
3. Writing: Creating Digital Profile
4. Speaking: Spin a Yarn
5. Grammar: Subject Verb Agreement

* Speaking Components are meant only for internal tests

Teaching Methodology	Lecture, Multimedia Presentations, Discussion and Enacting
Assessment Tools	Speaking, reading, listening and written tests

Books for Study:

1. Francis, V., Dr. D.R. Edwin Christy and Dr. D. Loyola Innaci. *Lingua Science – II,* St. Joseph's College (Autonomous), Tiruchirappalli.

Books for Reference:

1. Wilfred, D. Best. *Students Companion*. Harper Collins Publishers, 2020.
2. Dickinson, Emily. *The Complete Poems of Emily Dickinson*, Back Bay Books, 1973.

Websites and eLearning Sources:

1. https://www.nobelprize.org/prizes/physics/1903/marie-curie/biographical/
2. https://www.gutenberg.org/files/59637/59637-h/59637-h.htm
3. https://www.nms.ac.uk/discover-catalogue/the-story-of-dolly-the-sheep
4. https://sites.uni.edu/morgans/astro/course/TheStar.pdf
5. https://poemverse.org/short-poems-about-science/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Identify and comprehend the local and global issues through the lessons	**K1**
CO2	Use interactive skills	**K2**
CO3	Develop the Listening and Reading Skills of the learners through teacher-led reading practice	**K3**
CO4	Improve their General Writing Skills such as Note-Taking, Note- Making Précis Writing, Paragraph Writing, and Writing Short Essays on Current	**K4**
CO5	Develop their Creative and Critical Thinking and Speaking Skills	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UEN42GE04B**			**General English - 4:** English for Science - 2						**5**	**3**
Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	3	2	3	2	3	2	2.4
CO2	2	2	3	2	3	3	2	3	2	2	2.3
CO3	2	3	2	3	2	2	3	2	3	2	2.4
CO4	2	2	3	2	3	3	2	3	2	3	2.5
CO5	2	2	2	3	2	2	2	3	2	2	2.2
										Mean Overall Score	**2.36 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43CC06	**Core Course - 6:** General Chemistry - 5	4	3

Course Objectives
To understand the basic principle of p-block elements and nuclear chemistry
To Identify the important compounds of p-block elements and nuclear models
To Examine the various reaction of p-block elements and nuclear reactions
To Comprehend the concepts of ionic equilibrium
To remembering names and identify the different crystal structures

UNIT I: Group-16 Elements (12 Hours)

General characteristics – oxidation states – difference between oxygen and other elements-general properties of oxides-Normal oxides, peroxides, suboxides- acidic oxides, basic oxides, amphoteric oxides-reactions between oxides- oxides of sulphur, selenium, tellurium and polonium- dioxides, trioxides and poly oxides-oxoacids of sulphur, selenium, tellurium and polonium-sulphurous acid series, sulphuric acid series, thionic acid series and peroxoacid series-oxohalides-hydrides-halides- compounds of sulphur and nitrogen.

UNIT II: Chemistry of Group-17 and Group-18 Elements (12 Hours)

Group-17 elements

General characteristics-Oxidation state -Bonding energy in X_2 molecules-Oxidizing power -Reaction with water-Hydrogen halides (HX)-Halides-ionic halides, molecular halides and bridging halides- Halogen oxides (OF_2, O_2F_2, Cl_2O, ClO_2, Cl_2O_6, Cl_2O_7)-Oxoacids of halogens (HOX, HXO_2, HXO_3 and HXO_4)-strength of oxoacids. Interhalogen compounds (AX, AX_3, AX_5 and AX_7)-preparation, structure and hydrolysis reaction-Poly halide ions - Pseudo halogens and pseudo halide ions

Group-18 elements

Electronic structure-occurrence and recovery of noble gases-Special properties of helium–Clathrate compounds -Chemistry of xenon–Xenon fluoride complexes-structure and bonding in xenon compounds (XeF_2, XeF_4 and XeF_6).

UNIT III: Nuclear Chemistry (12 Hours)

The atomic nucleus - Structure of the nucleus –Liquid drop model, shell model-Forces in the nucleus - Stability and the ratio of neutrons to protons - Modes of decay – beta emission, neutron emission, positron emission, orbital or K-electron capture, proton emission, gamma radiation - Half-life period - Binding energy and nuclear stability - Alpha decay - Radioactive displacement laws - Radioactive decay series - Induced nuclear reactions – fission and critical mass - Nuclear fusion.

UNIT IV: Ionic Equilibrium (12 Hours)

Electrolytes-degree of ionization- factors affecting the degree of ionization- ionization constant and ionic product of water-ionization of weak acids and bases-pH scale-common ion effect- dissociation constants of mono-, di-, and tri-protic acids- salt hydrolysis- calculation of hydrolysis constant, degree of hydrolysis and pH for different salts-Buffer solutions-derivation of Henderson's equation and its applications-buffer capacity-buffer range-buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body.

UNIT V: Solutions (12 Hours)

Ideal solution, (Raoult's law and Henry's law), definition of an ideal solution, Non ideal solutions, - activity and activity coefficients. The colligative properties – Ideal solubility and freezing point depression, Boiling point elevation and its constant, Osmotic pressure and Vant Hoff's equation – Problems based on colligative properties.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Lee J D, (2017). Concise *Inorganic Chemistry*, (5th Ed,), Blackwell Science Ltd, Oxford, London.
2. Laidler, K. J., & Meiser, J. H. (2006). *Physical Chemistry* (2nd Ed.). CBS Publishers & Distributors.

3. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). Principles of Physical Chemistry (49th Ed.). Shoban Lal Nagin Chand & Co.

Books for Reference:

1. Catherine E. Housecroft and Alan G. Sharpe, *Inorganic Chemistry*, (2nd Ed.). Person Prentice Hall.
2. Atkins, P.W., & Paula, J. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.
3. Castellan, G. W. (2004). *Physical Chemistry* (4thEd.). Narosa.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=qJfSnd0JFSo
2. https://www.youtube.com/watch?v=vOXthwloFao
3. https://www.youtube.com/watch?v=cPRFF-eCGT8
4. https://www.nios.ac.in/media/documents/SrSec313NEW/313_Chemistry_Eng/313_Chemistry_Eng_Lesson12.pdf
5. https://study.com/learn/lesson/solutions-in-chemistry.html

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Describe the general characteristics of p- block elements and to remember the types of solutions	**K1**
CO2	Understand the basics periodic trends of p-block elements and ionic equilibrium concepts	**K2**
CO3	Apply the concepts of different oxidations states of elements inorganic molecules	**K3**
CO4	Analyze the structure of various hydrides, oxides, nitrides of p-block elements based on the periodic trends	**K4**
CO5	PREDICT the product of various inorganic reactions based on reactivity of p-block elements	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UCH43CC06**			**Core Course - 6:** General Chemistry - 5						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	1	2	3	2	3	1	2	3	2	**2.1**
CO2	3	1	2	2	3	3	2	1	3	2	**2.2**
CO3	2	2	1	3	2	2	1	2	3	2	**2.0**
CO4	3	3	2	1	2	2	2	3	2	2	**2.2**
CO5	3	2	2	3	3	2	3	2	2	3	**2.5**
Mean Overall Score											**2.1 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43CC07	**Core Course - 7:** General Chemistry - 6	4	3

Course Objectives
To understand the principles of aromaticity, electrophilic aromatic substitution mechanisms, and the reactivity of polynuclear aromatic compounds.
To explore the structure, reactivity, and functional transformations of alcohols, ethers, and phenols.
To analyze the conformational stability, strain, and stereochemical aspects of cycloalkanes and their derivatives.
To elucidate the principles of phase equilibria, Gibbs phase rule, and phase transitions in single-component systems.
To investigate the phase behavior of multi-component systems, with an emphasis on solid-liquid and gas-solid equilibria.

UNIT I: Aromaticity and Polynuclear Compounds (12 Hours)

Criteria for aromaticity – Huckel's rule– aromatic hydrocarbons – cations and anions – annulenes – consequences of aromaticity: pKa, solubility and dipole moment – molecular orbital description of aromaticity and anti–aromaticity. Electrophilic aromatic substitution– general mechanism – reaction coordinate diagram – mechanism of halogenation, nitration, sulphonation– Friedel–Craft's alkylation, Friedel–Craft's acylation – acylation followed by Clemmensen and Wolff–Kishner reductions.

Orientation and reactivity of aromatic electrophilic substitution reactions of mono – and disubstituted benzenes – activating and deactivating groups – ortho/para and meta directing groups.

UNIT II: Alcohols, Ethers and Phenols (12 Hours)

Alcohols as acids and bases – reactions of alcohols – substitution reactions of alcohols – conversion into sulphonate esters – tests for alcohols – Williamson synthesis – reactions of ethers – cleavage by acids – substitution reactions in ethers – analysis of ethers, Crownethers–Structure–Applicationsas PTC, Phenol-reactions of –OH group and benzene ring, Pinacol– Pinacolone and Dienone–Phenol rearrangements.

UNIT III: Conformational Analysis (12 Hours)

Cycloalkanes- Baeyer strain theory, heat of combustion and relative stability of cycloalkanes, orbital picture of angle strain, factors affecting stability of conformations, conformation of cycloalkanes including ethane and n-butane, equatorial and axial bonds in cycloalkanes, mono-, di-substituted cycloalkanes, stereoisomerism of cyclic compounds: cis and trans isomers.

UNIT IV: Phase Rule I (12 Hours)

Phase rule – Meaning of the terms: phase, Component, degrees of freedom – Derivation of Gibbs phase rule – Phase diagrams of one component systems (Water, CO_2, and sulphur systems) - polymorphism- application of Clapeyron-Clausius equation to water system-liquid helium system.

UNIT V: Phase Rule II (12 Hours)

Phase diagrams of two component systems solid-liquid equilibrium – simple eutectic-thermal analysis - Bi-Cd system – Pb-Ag systems – KI- water system – Phase diagram of system with compound formation with congruent melting point – Mg-Zn System – incongruent melting point – Na-K system – NaCl Water system – $FeCl_3$ -Water system – Freezing mixture – gas-solid equilibrium – $CuSO_4$ –water system – Efflorescence – Deliquescence- three component system (Acetic acid -Chloroform-Water) only.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Bruice, P Y. (2011). *Organic Chemistry*, (8th Ed.). Pearson Ltd.
   Unit – I
   Unit – II
   Unit – III
2. Puri, B. R., Pathania, M. S., & Sharma, L. R. (2025). *Principles of Physical Chemistry*, (49th Ed.). Vishal Publishing Co.

Unit – IV
Unit - V

Books for Reference:

1. Robert, T. M. & Robert, T. B. (2011). *Organic Chemistry*, (7th Ed.). Allyn and Bacon Ltd
2. Finar, I. L. (1996). *Organic Chemistry*. Vol: 1and 2, (6th Ed.). Addison Wesley Longman Ltd.
3. Soni, P. L., & Chawla, H. M. (2010). *Text Book of Organic Chemistry*, (29th Ed.). Sultan Chand & Sons.
4. Atkins, P.W., & Paula, J. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.

Websites and eLearning Sources:

1. https://youtu.be/2Pz0LXbsn-c?feature=shared
2. https://youtu.be/J6kBsreX5Ts?feature=shared
3. https://youtu.be/fpq0eICjuSI?feature=shared

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Gain knowledge of aromaticity criteria, reaction mechanisms, substituent effects, and key transformations of aromatic and polynuclear compounds.	**K1**
CO2	Understand the acid-base properties, substitution reactions, synthesis methods, and rearrangements of alcohols, ethers, and phenols.	**K2**
CO3	Develop a profound understanding of conformational analysis, strain theories, and stereoisomerism in cyclic systems.	**K3**
CO4	Acquire a comprehensive understanding of phase diagrams, polymorphism, and the thermodynamic applications of the Clapeyron-Clausius equation.	**K4**
CO5	Gain an in-depth understanding of eutectic systems, compound formation, melting phenomena, and phase interactions in multi-component mixtures.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UCH43CC07**			**Core Course - 7:** General Chemistry - 6						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	1	2	3	1	2	3	2	3	3	**2.1**
CO2	3	3	2	3	2	2	3	2	1	1	**2.2**
CO3	1	3	3	3	2	2	3	1	2	3	**2.3**
CO4	2	3	1	3	3	2	2	3	3	1	**2.3**
CO5	2	2	2	3	1	2	2	3	1	3	**2.1**
										Mean Overall Score	**2.1 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43CP04	**Core Practical - 4:** Physical Chemistry Practical - 2	3	2

Course Objectives
To learn the different concentration terms
To recognize the principles of conductance and potentiometry
To learn how to prepare solutions of different concentration
To apply the knowledge of conductometry and potentiometry to different titrations
To experiment the principles of conductometry and potentiometry in acid - base, precipitation and redox titrations

UNIT I: Theory of the Practicals **(9 Hours)**

Theory of the practical's - critical solution temperature - transition temperature - heat of neutralization - kinetics of persulfate oxidation - phase diagram (simple eutectic) - potentiometry - conductometry - calculation of parameters with units - drawing graphs - handling of various equipment used in physical chemistry practical.

UNIT II: Cycle I **(9 Hours)**

1. Determination of molecular weight - Rast's method.
2. Phase diagram of a simple eutectic system and determination of unknown composition

UNIT III: Cycle II **(9 Hours)**

1. Kinetics of persulphate - iodide reaction.
2. Effect of impurities on critical solution temperature of Phenol - Water system

UNIT IV: Cycle III **(9 Hours)**

1. Conductometric Precipitation titration
2. Determination of limiting molar conductance of a strong electrolyte (KCl) by conductometry.
3. A study of weak electrolytes - Ostwald's dilution law.
4. Verification of Onsager equation.

UNIT V: Cycle IV **(9 Hours)**

1. Potentiometric Redox Titration.
2. Determination of strength of a weak acid by potentiometric titration (CH3COOH Vs NaOH).

Teaching Methodology	Laboratory Demonstration
Assessment Methods	Test, viva voce

Books for Study:

1. Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli. *Lab manual.*
2. Venkateswaran, V., Veeraswamy, R., &Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry* (2nd Ed.). Sultan Chand & Sons.

Books for Reference:

1. Daniels, F., Mathews, F., Howard, J., & Warren, J. W. (1970). *Experimental Physical Chemistry* (7th Ed.). McGraw-Hill.
2. Findlay, A. (1959). *Practical Physical Chemistry* (7th Ed.). Longman.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=Xb_O3XRQFFc
2. https://www.youtube.com/watch?v=xQ5U6McQ0XU

Conductometric precipitation Titration

CST of Phenol-water system

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Describe the theoretical concepts while performing experiments.	**K1**
CO2	Acquire practical skill to estimate the strength of acid and base by conductometric method	**K2**
CO3	Learn the effective usage of chemicals.	**K3**
CO4	Acknowledge experimental errors and their possible sources.	**K4**
CO5	Design, carry out, record and analyze the results of chemical experiments	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
4	**25UCH43CP04**	**Core Practical - 4:** Physical Chemistry Practical - 2								**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	1	2	3	4	2	3	2	3	3	**2.4**
CO2	2	3	4	3	4	2	1	3	4	3	**2.9**
CO3	1	3	1	4	3	2	2	3	3	1	**2.3**
CO4	2	3	2	3	2	2	3	2	1	4	**2.4**
CO5	3	4	3	3	2	2	3	1	2	3	**2.6**
Mean Overall Score											**2.52 (High)**

Scheme for valuation

Core Practical 4: Physical Chemistry Practical - 2

INTERNAL

CIA	**100 Marks**
Cumulative mark of Regular Practical Classes	50 Marks
Two CIA tests	50 Marks

For Each CIA Test	***100 marks***
Theory/Test	10 Marks
Record	10 Marks
Principle & short procedure	10 marks
Calculation & Tabulation	10 marks
Graph	10
Results	50 Marks

Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

EXTERNAL

Total	**100 Marks**
Theory/Test	10 Marks
Record	10 Marks
Principle & short procedure	10 marks
Calculation & Tabulation	10 marks
Graph	10
Results	50 Marks

Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43AO02A	**Allied Optional - 2:** Physics - 2	4	3

Course Objectives
To acquire knowledge about interference, diffraction, structure, behaviour and properties of atoms based on vibrational modes.
To acquire and recall nuclear models, nuclear properties, fundamental concepts of relativity and logic gates.
To understand the theoretical and experimental concepts of interference, diffraction and propagation of light, nuclear reactions, various quantum numbers, eigen values and eigen functions.
To apply the concepts of optics, atomic, nuclear and digital electronics for solving problems.
To analyze the behaviour of interference, diffraction and polarization, orbital and spin motion, nuclear reactions and relativistic concepts.

UNIT I: Physical Optics **(12 Hours)**

Velocity of light - Michelson's method - Interference: colours of thin films - Air wedge - Determination of diameter of a thin wire by air wedge - test for Optical flatness. Diffraction - Fresnel'sexplanation of rectilinear propagation of light - theory of diffraction and specific rotating power of transmission grating - Normal incidence - polarization - Brewster's law - double Refraction - optical activity - polarimeter.

UNIT II: Atomic Physics **(12 Hours)**

Atom model - vector Atom model - quantum numbers associated with vector atom model - coupling schemes - Pauli's exclusive principle - magnetic dipole moment of electron due to orbital and spin motion - Bohr magneton - spatial quantization - Stern Gerlach experiment.

UNIT III: Nuclear Physics **(12 Hours)**

Nuclear model - liquid drop model - magic numbers, shell model - nuclear Energy - mass defect - binding energy - Radiation detectors - ionization chambers - GM counter - nuclear fission - Bohr and wheeler theory - chain Reaction - atom bombs - nuclear fusion - calculation of energy released in a fusion - nuclear reactor - Source of solar energy: proton -proton cycle - Carbon-nitrogen cycle.

UNIT IV: Elements Of Relativity And Quantum Mechanics **(12 Hours)**

Frame of reference - Galilean transformation - Postulates of theory of relativity - Lorentz transformation equations - derivation - length contraction - time dilation - uncertainty principle - postulates of wave mechanics - wave nature of matter - types of operators - Schrodinger's time dependent and time independent equation - Eigen functions and Eigen values - The particle in a box (infinite Square well potential).

UNIT V: Electronics **(12 Hours)**

Basic Electronics: Semiconductors, *pn* junction diode - Zener diode and characteristics - voltage regulator - LED - Common emitter transistor amplifier (principle) - Transistor RC coupled amplifier.
Digital electronics: Logic gates - NAND and NOR gates - Universal building blocks - Boolean algebra - De Morgan's theorem - verification.

Teaching Methodology	Chalk and Talk, Demo Videos, PPT, Hand-outs
Assessment Methods	Seminar, Snap Test, MCQ, Online Quiz, Assignment

Books for Study:

1. Murugesan, R (2015). *Allied Physics* (*Reprint*). S Chand and Co. Publications.

Unit	Book	Chapter	Section
I	1	6	6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.8, 6.9, 6.10, 6.11, 6.12, 6.13, 6.14, 6.17, 6.19, 6.20
II	1	7	7.1, 7.2, 7.3, 7.4, 7.7.6, 7.7, 7.8
III	1	8	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.10, 8.11, 8.12, 8.13, 8.14, 8.16, 8.17, 8.18
IV	1	9	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.10, 9.12, 9.13, 9.14, 9.15, 9.18, 9.19
V	1	10	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.11, 10.12, 10.13, 10.14, 10.15, 10.16, 10.17, 10.18, 10.19, 10.21

Books for Reference:

1. Halliday, D., Resnick, R., & Walker, J. (2010). *Fundamental of Physics,* (9th Ed.). John Wiley & Sons.
2. Schaltz, M.E. (2011). *Grob's Basic Electronics*, (11th Ed.). McGraw Hill.
3. Beiser, A. (2009). *Concepts of Modern Physics*. Special Indian Edition, Tata McGraw Hill.
4. Murugeshan, R & Kiruthiga, S. (2009). *Modern Physics,* (14th Ed.). S. Chand & Co.

Websites and eLearning Sources:

1. https://archive.nptel.ac.in/courses/115/107/115107131/
2. https://archive.nptel.ac.in/courses/115/105/115105100/
3. https://archive.nptel.ac.in/courses/115/103/115103101/
4. https://archive.nptel.ac.in/courses/115/101/115101011/
5. https://nptel.ac.in/courses/117106086

(subject to availability - not to be used for exam purpose)*

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Able to acquire knowledge about the fundamentals of physics discipline such as optics, atomic and nuclear physics, elements of relativity, quantum mechanics and electronics.	**K1**
CO2	Understand the concepts of interference, diffraction, polarization, structure of atom, nucleus and its properties, relativistic phenomena, quantum wavefunction and electrical circuits.	**K2**
CO3	Apply the optical, electrical, atomic and nuclear concepts learned in the classroom for problem solving.	**K3**
CO4	Analyse the atomic, optical, nuclear and electrical properties learned from class room with real life problems.	**K4**
CO5	Evaluate the different atomic models and analysis the different optical phenomena observed in day to day life.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
4	**25UCH43AO02A**			**Allied Optional - 2:** Physics - 2					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	1	2	3	2	1	2	2	**2.0**
CO2	3	3	2	2	2	3	2	2	2	2	**2.3**
CO3	3	3	2	3	2	3	3	3	2	2	**2.6**
CO4	3	3	2	3	2	3	2	3	2	2	**2.5**
CO5	3	3	2	3	2	3	3	3	2	2	**2.6**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43OP01A	**Allied Optional Practical:** Physics	2	2

Any 16 of the following

1. Young's modulus – Non uniform bending – cantilever
2. Young's modulus – cantilever
3. S. T. – Method of drops
4. S. T. – Capillary rise
5. Viscosity – variable pressure head
6. Concave lens – f, R, μ
7. Air wedge – Thickness of wire
8. Newton's Rings R
9. Spectrometer –solid prism
10. Spectrometer – Grating (Normal Incidence)
11. M1/M2 – Tan A and Tan B simultaneous method
12. Absolute determination of M and H
13. P.O. Box – Temp. Coefficient
14. Potentiometer – Ammeter calibration
15. Potentiometer – R and □
16. Field along the axis of the coil
17. Sonometer – Frequency of tuning fork
18. Junction diode characteristics
19. Zener diode characteristics
20. Logic gates – ICs
21. Jolly's bulb

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43AO02B	**Allied Optional Course – 2:** Communication Electronics	4	3

Course Objectives
Understand digital communication fundamentals and work with serial (UART, USART) and parallel ports for data transfer
Analyze optical communication principles, including fiber optics, waveguides, and photodetectors.
Explore wireless communication technologies, including cellular networks (3G, 4G, 5G), WLAN, Bluetooth, and PAN.
Develop IoT applications using ESP32, focusing on Wi-Fi networking, cloud integration, and AI-based edge computing.
Implement basic networking with ESP8266, including web server setup, data posting to cloud platforms

UNIT I: Serial and Parallel Port Communication (12 Hours)

Basics of digital communication- Parallel port interfacing for simple I/O operations - Serial communication-UART-USART-Data transfer using serial port- USB port specifications-HID device USB for data transfer applications-Communication protocols-SPI-IIC-Applications.

UNIT II: Optical Communication (12 Hours)

Basics of optical communication-Block diagram of Optical fibre communication-advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, single mode fiber, cutoff wave length, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers. Photo detectors -LM393 light sensor module TCS3200 color sensor module.

UNIT III: Wireless Communication (12 Hours)

Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication-Third generation Cellular Networks- Fourth Generation, fifth generation wireless networks- Wireless Local Loop (WLL)-Wireless Local Area network(WLAN)- Bluetooth and Personal Area Networks.

UNIT IV: Basic Networking with ESP32 (12 Hours)

Overview of ESP32 architecture and features - Introduction to IoT concepts and applications - Setting up MicroPython and Thonny IDE for ESP32 -Flashing firmware and writing basic scripts - Wi-Fi connectivity: Connecting ESP32 to a network - Data encryption & security in IoT – Cloud and Edge computing and AI in IoT

UNIT V: Basic Networking with ESP8266 (12 Hours)

Introduction to ESP8266 Wi-Fi Module- Wi-Fi library-Web server- installation - configuration - Posting sensor(s) data to web server-ThingSpeak API and MQTT.

Teaching Methodology	Demo Videos, Review, PPT, Exercises, circuit simulation
Assessment method	Circuit design, written assignment, MCQ test, Open book test, snap test

Books for Study:

1. Mathivanan, N. (2007). PC- Based Instrumentation: Concepts and Practice.
2. Senior, J.M. (2002). Optical Fiber Communications, (2nd Ed.). PHI.
3. Thakur, M.R. Node MCU ESP8266 Communication Methods and Protocols Programming with Arduino IDE.
4. Material Prepared by the Department

Unit	Book	Chapter	Sections
I	1	6	6.1,6.2,9.2,9.3,9.4,9.5
II	2	1,2,3,5	1.2,1.3,2.1,2.2,3.6,5.3
III	2	7,8	7.2,8.1.8.3,8.5,8.6,8.8
IV	4		Material prepared by the department.
V	3	4,5,21	4.1,4.2,4.3,5.2,21.1-21.3

Books for Reference:

1. Axelson, J. (2012). *USB Complete: The Developer's Guide, (4th Ed.).*
2. Gehlot, A., Singh, R., Malik, P.K., Gupta, L.R., Singh, B. (2020). *Internet of things with 8051 and EPS8266.*

Websites and eLearning Source

1. https://onlinecourses.nptel.ac.in/noc23_ma94/preview

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand serial and parallel Communication	**K1**
CO2	Infer and Elaborate Optical Communication	**K2**
CO3	Experiment and Perceive various optical sources and detectors	**K3**
CO4	Appraise various Wireless Networks	**K4**
CO5	Apply and Analyze wireless networking using ESP 8266	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
4	**25UCH43AO02B**			**Allied Optional Course - 2:** Communication Electronics					**4**	**3**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	2	1	2	3	3	2	2	**2.2**
CO2	3	3	2	2	2	3	3	2	2	3	**2.5**
CO3	3	3	2	3	2	2	3	3	2	2	**2.5**
CO4	3	3	3	3	2	2	3	3	3	2	**2.7**
CO5	3	3	3	3	2	3	3	3	3	3	**2.9**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH43OP01B	**Allied Optional Practical:** Electronics	4	2

Any 16 Experiments:

1. Study of Opto-coupler characteristics and application.
2. Study of Photodiode and phototransistor characteristics
3. Study of Transducers for temperature measurements.
4. Study of MOSFET characteristics.
5. Study on Integrated sensors
6. Construction and study of Linear power supply
7. Construction of voltage regulators.
8. Pspice simulation of basic circuits with resistors and node voltage and branch current calculation.
9. Study on magnetic and solid state relay.
10. Study of SCR characteristics
11. DC to DC switching circuits using MOSFET
12. Pspice simulation of active devices.
13. Configuring ESP8266 based Web-server for data acquisition applications.
14. Digitizing temperature sensor data and uploading in thingspeak API.
15. Study of USB communication (HID device).
16. Study of software serial communication in ESP8266.
17. Study of fibre optic communication.
18. Hall effect sensor for current measurement
19. ESP 8266 I/O operations
20. ESP 32 I/O operations using python
21. ESP 32 /8266 interface with opencv operations using python
22. ESP 32 interface with sensors
23. Interfacing RFID module using Arduino.
24. Interfacing IIC memory module using Arduino.
25. Interfacing HC-05 bluetooth module with arduino
26. Study of Parallel port for I/O operations
27. Study of Serial port data transfer to hyper-terminal.
28. Study of Colour sensing using TCS3200.

Semester	Course Code	Title of the Course	Hours / Week	Credits
4	25UHE44VE04A	**Value Education - 4:** Social Ethics - 2	2	1

Course Objectives
To understand the significance of natural resources and strive to coexist harmoniously with nature.
To implement strategies for disaster management within the community.
To evaluate the significance and distinctions between science and religion.
To recognize the importance of maintaining a healthy lifestyle.
To utilize counseling techniques to address and resolve individuals' issues.

UNIT I: Harmony with Nature (6 Hours)

What is environment, why should we think of harmony, longing for human well-being, Principles to conserve environmental resources, causes of disharmony, the fruits of harmony with nature, Forest resources, Water resources, Mineral resources, Food resources, Fruits of disharmony, Economic values and growth, Environmental Ethics, Guidelines to live in harmony with nature, Towards life-centered system for better quality of life. Harmony with animal kingdom.

UNIT II: Issues Dealing with Science and Religion (6 Hours)

What is Science, Science and Religion, Social Relevance of Science and Technology, Science and technology for social justice, Difference caused by Science and Technology, Need for indigenous technology, Science, Technology and Innovation Policy of India.

UNIT III: Public Health (6 Hours)

Health related issues, Health Care in India vs Developed Countries, Health and Heredity, Public Health - The Indian Scenario, Objectives of public health in India, Public Health System in India, Failure on the public health front, Role of the central government, Hospitals Services in India, Health and Abortion, Health and Drug Addiction, Drug abuse.

UNIT IV: Disaster Management (6 Hours)

Disaster Management, Types of disaster, plans of disaster management, Technology to manage natural disasters and catastrophes, Disaster Management, Rehabilitation and Reconstruction, Human-induced disaster, First Aid, The importance of First-aid, Disaster Declaration and Response.

UNIT V: Counseling for Adolescents (6 Hours)

High Risk Behaviours, Developmental Changes in Adolescents, Key Issues of the Adolescents, need for Counseling, Nature of Counseling, Counseling Goals, does helping help? The Good and the Bad news. Importance of Career Guidance Counseling.

Teaching Methodology	Power point, Assignment and Group discussion
Assessment Methods	Online Test, Group Discussions, Seminar, Assignment

Books for Study:

1. Department of Human Excellence. (2021). *Formation of Youth*, St Joseph's College (Autonomous), Tiruchirappalli.

Books for Reference:

1. Albert, D., & Steinberg, L. *Judgment and decision making in adolescence*: Journal of Research on
2. Adolescence, page no: 211-224 (2011).
3. Larry, R. C. (2000). *Disaster Management and Preparedness,* Lewis Publications.
4. Hurlock, E.B. (2001). *Developmental Psychology: A: Life-Span Approach*. (5th Ed.). Tata McGraw-Hill.
5. Sangha., & Kamaljit. (2015). *Ways to Live in Harmony with Nature: Living Sustainably and*
6. *Working with Passion.* Australia, Woods lane Pty Limited.

Websites and eLearning Sources:

1. https://en.wikipedia.org/wiki/Disaster_management_in_India
2. https://ndma.gov.in/
3. https://talkitover.in/services/child-adolescent-counselling/
4. https://www.nipccd.nic.in/schemes/adolescent-guidance-centre-19#gsc.tab=0

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Know the value of natural recourses and to live in a harmony with nature.	**K1**
CO2	Apply the plans of disaster management in the society.	**K2**
CO3	Analyse the importance and differences of science and religion.	**K3**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UHE44VE04A**			**Value Education - 4:** Social Ethics - 2						**2**	**1**
Course Outcome	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	3	2	3	3	**2.8**
CO2	3	2	2	3	3	2	3	3	2	2	**2.5**
CO3	2	3	3	3	2	3	3	3	3	3	**2.8**
										Mean Overall Score	**2.7 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UHE44VE04B	**Value Education - 4:** Religious Doctrine - 2	2	1

Course Objectives
To explore the rich historical background of the Catholic Church
To explore and comprehend the Sacraments practiced by the Catholic Church
To incorporate Christian Prayer into daily routines
To reflect on personal growth through the lens of Sacraments and Christian Prayer
To promote unity by embracing universal values from various religions

UNIT I **:** The Catholic Church **(6 Hours)**

UNIT II **:** Sacraments of Initiation **(6 Hours)**

UNIT III **:** Sacraments of Healing & at the Service of Community **(6 Hours)**

UNIT IV **:** The Christian Prayer **(6 Hours)**

UNIT V **:** Harmony of Religions **(6 Hours)**

Teaching Methodology	Power point, assignment, and Group discussion
Assessment Methods	Seminars, Group Discussion, Online Tests, Assignments

Books for Study:

1. Department of Human Excellence (2022). Fullness of Life, St Joseph's College (Autonomous), Tiruchirappalli.

Books for Reference:

1. (1994). *Compendium: Catechism of the Catholic Church.* Bengaluru: Theological Publications in India. Holy Bible (NRSV).

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Understand the history of the Catholic Church	**K1**
CO2	Examine and grasp the Sacraments of the Catholic Church	**K2**
CO3	Apply the Christian Prayer to their everyday life	**K3**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UHE44VE04B**			**Value Education - 4:** Religious Doctrine - 2						**2**	**1**
Course Outcome	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	2	2	3	3	**2.7**
CO2	3	2	2	2	3	3	3	3	2	2	**2.5**
CO3	2	2	3	3	2	2	3	3	3	3	**2.6**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH44SE02	**Skill Enhancement Course - 2:** Current Trends in Industrial Chemistry (Intership Embedded Course)	2	1

Course Objectives
To understand water hardness and the associated problems caused by hard water.
To classify the different sources of petrochemicals, including crude oil, coal, natural gas, and shale oil.
To analyze the structures and applications of major insecticides, herbicides, and fungicides used in modern agriculture.
To evaluate the importance of personal protective equipment, chemical labeling, and laboratory safety protocols.
To create a safe environment in laboratories and follow safety standards.

UNIT I: Petrochemicals (6 Hours)

Crude oil and its constituents, coal, natural gas and shale oil, industrial manufacture of-ethylene-direct chlorination, oxychlorination, dehydrohalogenation, propylene and its conversion to cumene, phenol, acetone, bisphenol-a, acrolein, highlighting features of reviews- From fossil to green chemicals, emerging trends towards net zero emission

UNIT II: Industrial Water Treatment (6 Hours)

Characteristics of water, water for industry, chemistry of water, water as a solvent, purification of water, hardness of water, permanent and temporary hardness, Determination of hardness, problems in hardness of water. Recent trends in water treatment in dying and textile industries.

UNIT III: Chemicals in Agriculture (6 Hours)

Insecticides-structure and uses of diazinon, chlorpyrifos, malathion, aldicarb, methiocarb, methomyl, carbofuran, bendiocarb, oxamyl, ddt, chlordane, dieldrin, endosulfan.

Herbicides-structure and uses of glyphosate, chlorsulfuran, azimsulfuran, imazapic. 2,4-dichlorophenoxyacetic acid.

Fungicides-structure and uses of ergosterol, tebuconazole, difenoconazole, epoxiconazole, flutolanil.

UNIT IV: Chemical Hazard Management (6 Hours)

Personal protective equipment, hair and apparel (dressing for the laboratory). laboratory protocols, labeling chemicals, cleaning glassware, inhaling harmful chemicals, disposal of chemicals, toxicity, exposure, routes of entry/exposure, dose, groups of chemicals known to elicit toxic effects, flammability, corrosivity, reactivity, oxidizers, peroxide-forming solvents, globally harmonized system (GHS) of classification and labelling of chemicals. GHS pictograms and hazards, Materials Safety Data Sheet (MSDS).

UNIT V: Safety Equipment and Emergency Response (6 Hours)

Fire Prevention, Chemical Contamination on Skin, Clothing, and Eyes, Preventing Chemical Contact, Prepare to Respond to Chemical Contact, Other Personal Injury, Preventing Other Personal Injuries, Chemical Spills, Preventing Chemical Spills, Prepare to Respond to a Chemical Spill.

Teaching Methodology	Chalk and talk, PPT, GHS pictograms, Material Safety Data Sheets
Assessment Methods	Poster presentations, Multiple choice questions, Group Discussion, Case study evaluation

Books for Study:

1. Tyrell, J. A, (2014). *Fundamentals of Industrial Chemistry Pharmaceuticals, Polymers, and Business*, (1st Ed.), Wiley, USA.
2. Finster, D. C., (2017). *Safety in Academic Chemistry Laboratories*, (8th Ed.), American Chemical Society, USA.
3. Sharma, B. K, (2023). *Industrial Chemistry* PART 1,(3rd Ed.) Krishna Prakash Publications, New Delhi.

Books for Reference:

1. Patnaik, P**.** (2007). *A Comprehensive Guide to the Hazardous Properties of Chemical Substances* (3rd Ed.). Wiley-Interscience, USA.
2. Vogel, A. I. (2000). *Vogel's Textbook of Quantitative Chemical Analysis* (6th Ed.). Pearson Education, UK.
3. Shreve, R. N., & Austin, G. T. (2012). *Shreve's Chemical Process Industries* (5th Ed.). McGraw Hill, USA.
4. Sittig, M. (1999). *Handbook of Toxic and Hazardous Chemicals and Carcinogens* (4th Ed.). Noyes Publications, USA.

Websites and eLearning Sources:

1. https://www.acs.org/content/dam/pldp/center/lab-safety/publications/safety-in-academic-chemistry-laboratories-students.pdf
2. https://onlinecourses.nptel.ac.in/noc23_ce12/preview
3. https://ecourses.icar.gov.in/
4. https://doi.org/10.1039/D3EE00478C
5. https://doi.org/10.1039/D3SU00368J

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Explain the characteristics of water, its industrial significance, and the chemistry behind water purification and softening processes.	**K1**
CO2	Compare and contrast the structures, functions, and effects of different fertilizers, insecticides, herbicides, and fungicides on agricultural productivity and environmental sustainability.	**K2**
CO3	Illustrate the industrial manufacturing processes of key petrochemicals such as ethylene, propylene, and BTX, and analyze their conversion into commercially important products.	**K3**
CO4	Assess the risks associated with various chemicals, interpret GHS pictograms, and propose appropriate safety protocols for handling, labeling, and disposing of hazardous substances.	**K4**
CO5	Develop a comprehensive safety strategy for preventing and responding to chemical spills, fires, and exposure incidents in industrial and laboratory environments.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**				**Hours**			**Credits**
4	**25UCH44SE02**			**Skill Enhancement Course - 2:** Current Trends in Industrial Chemistry (Intership Embedded Course)				**2**			**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	2	2	1	1	3	**2.0**
CO2	2	1	1	2	3	3	3	3	2	1	**2.1**
CO3	2	3	3	1	1	1	3	3	3	3	**2.1**
CO4	2	3	2	2	2	3	3	3	1	1	**2.1**
CO5	3	3	3	2	2	3	3	2	1	3	**2.3**
Mean Overall Score											**2.12 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UCH44SL03	**Self Learning:** Essentials of Chemistry	-	2

Course Objectives
To understand the biological functions and toxicity of Zinc, Cadmium and Mercury
To explain the applications of nanomaterials
To illustrate the synthesis and reactions of polymers
To understand the applications of organic synthetic reagents
To evaluate the structure and reactions of redox reagents

Unit I: Group 12– The Zinc Group

Abundance, occurrence, extraction and uses of Zn, Cd and Hg–oxidation states– complexes–polycations– Hg(I) complexes–organometallic compounds–biological role of zinc–toxicity of Cd and Hg–bio–accumulation of heavy metals and its consequences.

Unit II: Advanced Inorganic Materials

Artificially layered materials– quantum wells–solid state super lattices– artificially layered crystal structures– self–assembled nanostructures– supramolecular chemistry and morphosynthesis– dimensional control in nano structures– bio–inorganic nanomaterials– DNA and nanomaterials biomimetics– bionanocomposites– inorganic–organic nanocomposites.

Unit III: Bioinorganic Chemistry and Polymers

Bioinorganic catalysis– Zn enzymes, Mg enzymes and Fe enzymes–the reactions of Co containing enzymes– Mo and W enzymes– the nitrogen cycle– the hydrogen cycle– sensors– Fe proteins as sensors–Cu and Zn sensors– biomineralization– chelation therapy–cancer treatment–anti–arthritis drugs–imaging agents.
Rubber as a natural polymer – types of polymers – homopolymers, copolymers – addition and condensation polymers – polymerization reactions –vulcanization of rubber.

UNIT IV: Organic Synthetic Reagents

Synthesis and applications of - BuLi, B_2H_6, CH_2Cl_2, DCC, Grignard reagent, NBS, Ph_3P, PCl_5, NaN_3, $NaNO_2$, $SOCl_2$, Me_2S and Me_2CuLi.

Unit V: Organic Redox Reagents

Structures and applications of the following oxidants– PCC, H_2O_2, m–cpba, OsO_4, $KMnO_4$, HIO_4, and SeO_2. Reductants– $LiAlH_4$, $NaBH_4$, Raney nickel, Wilkinson catalyst, Lindlar's Catalyst, MPV, Clemmensen and Wolff–Kishner reductions and Birch reduction.

Teaching Methodology	Self Learning
Assessment Methods	Snap Test and MCQ

Books for Study:

1. Lee J D, (2010), *Concise Inorganic Chemistry*, (5th Ed.), Wiley–India.
   Unit I: *Chapter 28*
2. Atkins P, Overton T, Rourke J, Weller M and Armstrong F, *Shriver and Atkins*, (2010), *Inorganic Chemistry*, (4th Ed.)
   Unit II: *Chapter 24*
   Unit III: *Chapter 26*
3. Ahluwalia V K and Prashar R K, (2011), *Organic Reaction Mechanisms*, (4thEd.), Narosa Publishing House.
   Unit IV: *Chapter 8*
   Unit V: *Chapter 3 and 4*

Books for Reference:

1. Atkins P W, (1994), *Physical Chemistry*, (5th Ed.), Oxford University Press.
2. Finar I L, (1996), Organic Chemistry, Vol 1and 2, (6thEd.), Addison Wesley Longman Ltd.
3. Miessler G L, Fischer P J and Tarr D A, (2014), *Inorganic Chemistry, (*5th Ed.), Pearson Education.
4. Bruice, P Y, (2011), *Organic Chemistry*, (8th Ed), Pearson Ltd, University of California.

Websites and eLearning Sources:

1. https://www.frontiersin.org/articles/10.3389/fbioe.2020.00127/full
2. http://www.annclinlabsci.org/content/7/2/119.full.pdf

Nano scale Therapeutic Drug

Role of Metals in Enzyme Activity

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Describe advanced application of inorganic compounds in biological systems.	**K1**
CO2	Understand the utility of the synthetic organic reagents.	**K2**
CO3	Summarize the properties of zinc group metals and identify toxic behavior of the metals and related consequences.	**K3**
CO4	Predict the suitable organic synthetic reagent for reactions	**K4**
CO5	Prepare organic compounds using organic redox reagents	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
4	**25UCH44SL03**		**Self Learning:** Essentials of Chemistry							-	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	1	2	3	1	3	3	1	2	**2.2**
CO2	2	2	3	3	3	2	2	2	3	3	**2.5**
CO3	2	3	2	2	3	2	1	2	2	2	**2.1**
CO4	1	3	2	2	2	1	1	3	3	1	**1.9**
CO5	2	2	3	3	2	2	2	3	2	3	**2.4**
										Mean Overall Score	**2.22 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH 53CC08	**Core Course - 8:** Inorganic Chemistry - 1	5	4

Course Objectives
To ascertain structure and properties of solids
To describe and depict the structures and MO diagrams of molecules.
To outline the basics of coordination chemistry.
To predict the structure and stability of complexes.
To infer about the nature of transition elements.

UNIT I: Solid State Chemistry (15 Hours)

Structure of ionic solids - Radius ratio rule - Close packing of spheres - Ionic compounds of the type AX – NaCl, CsCl and ZnS - Ionic compounds of the type AX_2 – CaF_2 and TiO_2 -Lattice energy - Born-Haber cycle and Born-Lande equation (Derivation not required) - Polarizing power and polarizability – Fajan's rules - Stoichiometric defect – Schottky, Frenkel - Non-stoichiometric defects – metal excess and metal deficiency defects - Band theory of conductors, insulators and semiconductors - Superconductors.

UNIT II: The Covalent Bond (15 Hours)

Lewis theory – Octet rule and its exceptions - Drawing modern Lewis structures - Sidgwick-Powell theory - Valence Shell Electron Pair Repulsion (VSEPR) Theory - Structures of some simple molecules and ions using VSEPR theory – CH_4, NH_3, H_2O, PCl_5, ClF_3, SF_4, I_3^-, SF_6, IF_7, compounds of Xenon (XeF_2, X_3F_4, XeF_6, XeO_3, $XeOF_4$) - Valence bond theory - Hybridization – Predicting hybridization and geometry of some selected molecules – Resonance - Molecular orbital theory - The LCAO method - Different types of combinations of atomic orbitals - MO diagrams of simple homonuclear and heteronuclear diatomic molecules and ions – H_2, He_2, F_2, O_2, N_2, C_2, B_2, NO, O_2^- and O_2^{2-}

UNIT III: d-Block Elements (15Hours)

General characteristics – metallic character, variable oxidation state, complexes, sizes of atoms and ions, density, melting and boiling points, reactivity of metals, ionization energies, colour, magnetic properties, catalytic properties, non-stoichiometry

UNIT IV: Coordination Chemistry-I (15 Hours)

Coordination compounds - coordinate bond, coordination number, coordination sphere, oxidation state of the metal ion, coordination number and geometries - ligands - types of ligands - nomenclature of coordination compounds - Isomerism in coordination compounds-polymerization, ionization, hydrate, linkage, coordination, coordination position and stereoisomerism (geometrical and optical) - chelate complexes and chelate effect - EAN rule - Werner's theory - Valence bond theory

UNIT V: Coordination Chemistry-II (15 Hours)

Crystal field theory - splitting of d-orbitals in O_h, T_d and square planar environments -calculation of CFSE - effects of crystal field splitting - lattice energy, enthalpies of hydration - tetragonal - distortion in octahedral complexes (Jahn - Teller effect) -MO theory of complexes with and without pi bonding - pi acceptor ligands - pi donor ligands. (VBT).

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Lee, J. D. (1996). *Concise Inorganic Chemistry*, (5th Ed). Blackwell Science Ltd. Oxford.
   Unit-I: Chapter 18
   Unit-II: Chapter 29, 30
   Unit-III: Chapter 7
   Unit-IV: Chapter 7
   Unit-V: Chapter 32
2. Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2018). *Inorganic Chemistry*, (7th Ed.). Oxford University Press, Oxford.
   Unit-I: Chapter 19

Unit-II: Chapter 23
Unit-III: Chapter 7, 20
Unit-IV: Chapter 20
Unit-V: Chapter 20

Books for Reference:

1. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry*, (5th Ed.). Pearson Education.
2. Croft, C. E. H., Sharpe, A. G. (2012). *Inorganic Chemistry*, (4th Ed.). Pearson Education.
3. Cotton, F. A., Wilkinson, G., & Gauss, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John Willey and Sons. Inc.

Websites and eLearning Sources:

1. https://www.toppr.com/guides/chemistry/the-p-block-elements/group-17-elements/
2. https://www.britannica.com/science/coordination-compound/Characteristics-of-coordination-compounds
3. https://www.nios.ac.in/media/documents/SrSec313NEW/313_Chemistry_Eng/313_Chemistry_Eng_Lesson22.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify the lattice type from radius ratio rules	**K1**
CO2	Predict and depict the structures and MO diagrams of various molecules	**K2**
CO3	Use the formula to calculate the magnetic moments of complexes	**K3**
CO4	Analyze the theories of coordination compounds	**K4**
CO5	Calculate CFSE of tetrahedral and octahedral complexes	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
5	**25UCH53CC08**			**Core Course - 8:** Inorganic Chemistry - 1					**5**	**4**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	1	3	3	3	2	1	**2.2**
CO2	3	3	3	2	1	3	2	2	2	1	**2.2**
CO3	3	2	2	1	1	3	2	2	2	1	**1.9**
CO4	3	2	3	2	1	3	2	2	2	2	**2.1**
CO5	3	2	1	2	1	3	1	2	2	2	**1.9**
										Mean Overall Score	**2.06 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH53CC09	**Core Course - 9:** Organic Chemistry - 1	5	4

Course Objectives
To understand the properties and reactions of aldehydes and ketones
To explain the characteristics, structures and importance of carboxylic acids and their derivatives
To illustrate the naming reactions of active methylene compounds and organometallic compounds
To examine the reactions of nitro compounds
To evaluate the structures of aliphatic and aromatic heterocyclic compounds

UNIT I: Aldehydes and Ketones (15 Hours)

Nomenclature of aldehydes and ketones- relative reactivities of aldehydes and ketones with other carbonyl compounds – nucleophilic addition reactions –reactions of carbonyl compounds with carbon nucleophiles: Grignard reagents and cyanide ions – reaction with hydride ion: $NaBH_4$ and $LiAlH_4$–reactions with nitrogen nucelophiles:primary and secondary amines – formation of imine derivatives: oxime and hydrazine, Wolff–Kishner reduction– Clemmensen reduction - addition of oxygen nucleophiles: water, alcohol– addition of sulphur nucleophiles: thiols.

UNIT II: Carboxylic acids and their Derivatives (15 Hours)

Nomenclature of carboxylic acids, acyl halides, acid anhydrides, esters, lactones, amides, and lactams–structure of carboxylic acid derivatives–preparation of carboxylic acidderivatives – physical properties–acid strength of carboxylic acids and derivatives – nucleophilic substitution reactions – relative reactivity of carbonyl compounds – mechanism of nucleophilic acyl substitution reactions – reactions of acid halides – reactions of acid anhydrides –reactions of esters – acid catalyzed hydrolysis of esters – trans-esterification – hydroxide ion promoted ester hydrolysis.

UNIT III: Active Methylene Compounds and Organometallic Compounds (15 Hours)

Reactions at α–carbonyl carbons – acidity of α–hydrogens – pK_a values of carbon acids –keto–enol tautomerism–acid-catalyzed and base-catalyzed α–substitution reactions – haloform reaction – HVZ reaction –alkylation of the β–carbon: the Michael reaction – the aldol addition – mixed aldol condensation – Claisen condensation–mixed Claisen condensation–Dieckmann condensation–intramolecular aldol condensation– Robinson annulations. Grignard reagents – preparation and synthetic applications – organolithium reagents -preparation and its applications – organocopper reagents - preparation and synthetic applications

UNIT IV: Nitrocompounds and Amines (15 Hours)

Nitration of benzene, toluene, acetophenone, p-nitrotoluene and m-nitrotoluene – Reducing a nitro substitutent – Halogenation of nitrobenzene – Deactivating effect of nitro group in aromatic compounds – pK_avalue comparison of p-nitrophenol with other phenol derivatives – pK_a value comparison of p-nitrobenzoic acid with other benzoic acid derivatives – Nucleophilic aromatic substitution of nitrobenzenes containing halogen substituents (S_NAr reaction) – Mechanism.

Amines as bases and nucleophiles- Hofmann elimination reactions – Curitus, Schmidt, Lossen and Hofmann rearrangements.

UNIT V: Heterocycles (15 Hours)

Aromatic Heterocyclic compounds: structure and electrophilic aromatic substitution reactions of five membered heterocycles - pyrrole, furan, thiophene, indole and imidazole– Structure and nucleophilic substitution in six membered heterocycles-pyridine and quinoline.

Aliphatic heterocyclic compounds: structure of pyrrolidine and piperidine – Acidity comparison of pyrrolidine, piperidine and N-methylpyrrolidine – Basicity comparison of pyrrole, pyrrolidine and pyridine.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Morrison, R. T., & Boyd, R. T. (2011). *Organic Chemistry* (7thEd.). Allyn and Bacon Ltd.
   Unit–I : *Chapter 18*

Unit–II: *Chapter 19*

2. Bruice, P. Y. (2011). *Organic Chemistry* (8thEd.). Pearson Ltd.
   Unit–III: *Chapter 19*
   Unit–IV: *Chapter 12 & 21*
   Unit–V: *Chapter 24*

Books for Reference:

1. Pine, S. H. (1986). *Organic Chemistry* (4thEd.). McGraw-Hill International Book Company.
2. Finar, I. L. (1996). *Organic Chemistry* (6thEd.). Addison Wesley Longman Ltd.
3. Solomons, T. W. G. (1996). *Organic Chemistry* (6thEd.). John Wiley and Sons.
4. Wade, L. G. (2003). *Organic Chemistry* (5thEd.). Pearson Ltd.
5. Carey, F. A. (2000). *Organic Chemistry* (4thEd.). McGraw-Hill International Book Company.

Websites and eLearning Sources:

1. https://www.khanacademy.org/science/organic-chemistry/carboxylic-acids-derivatives
2. https://www.youtube.com/watch?v=EqOoM7h3gqg
3. https://www.masterorganicchemistry.com/2017/08/18/the-simple-two-step-pattern-for-seven-key-reactions-of-aldehydes-and-ketones/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Enumerate the structure, properties and relative reactivity of aldehydes and ketones.	**K1**
CO2	Understand the stereochemistry and importance of carboxylic acids and their derivatives	**K2**
CO3	Predict the products of reactions of active methylene compounds and organometallic compounds.	**K3**
CO4	Deduce selective reactions of nitro compounds with mechanism.	**K4**
CO5	Justify the acidic properties of aliphatic and aromatic heterocyclic compounds with structure	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
5	**25UCH53CC09**			**Core Course - 9:** Organic Chemistry - 1					**5**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	3	2	2	2	2	**2.2**
CO2	2	2	3	2	2	2	2	3	2	2	**2.2**
CO3	1	2	2	3	2	1	2	2	3	2	**2.0**
CO4	2	2	2	2	3	2	2	2	2	3	**2.2**
CO5	1	2	2	3	2	1	2	2	3	2	**2.0**
										Mean Overall Score	**2.12 (Medium)**

Semester	Course Code	Title of the Course	Hours	Credits
5	25UCH53CP05	**Core Practical - 5:** Organic Analysis and Determination of Physical Constants	8	3

Course Objectives
To understand the nature and preliminary tests of organic qualitative analysis
To determine the presence and absence of elements such as N/S/X.
To identify the functional group of the compounds from characteristic reactions.
To determine the boiling and melting point of organic compounds
To evaluate and predict the nature unknown organic compounds through qualitative tests

Unit I: Preliminary tests

Colour and appearance – solubility tests – acidic/basic/neutral nature – tests for aliphatic and aromatic compounds – tests for saturation/unsaturation

Unit II: Tests for elements like N/S/halogens

Preparation of sodium fusion extract –chemistry of converting organic N/S/halogens into inorganic ion in sodium fusion extract – tests for Nitrogen – tests for sulphur – tests for halogens such as chlorine, bromine and iodine – need for blank test

Unit III: Organic Analysis of Compounds

Tests for carbonyl functional groups – carboxylic acids, esters, aldehydes and ketones, phenol, sulphanilic acid, alcohol and hydrocarbon – Primary and secondary amines, amide, diamide, anilide, and nitro compounds

Unit IV: Preparation of Derivatives

Confirmation of the functional groups by preparation of solid derivatives/characteristic colour reactions for the functional groups – scientific reporting

Unit V: Determination of Physical constants

Determination of melting and boiling points of organic compounds of mp/bp below 200 degree celcius. (A minimum of 5 compounds each.)

Note:

1. Mono–functional compounds are given for analysis. In case of bifunctional compounds such as salicylic acid and sulphanilc acids students are required to report anyone of the functional groups.
2. Each student is expected to practice the analysis of at least 15 different organic substances.
3. Apart from the TWO CIA tests, one MODEL TEST comprising both Chemistry Practical IV and V for six hours is to be conducted to enable the students ready for semester examination.

Teaching Methodology	Laboratory Demonstration
Assessment Methods	Test, viva voce

Books for Study:

1. *Organic Chemistry Lab Manual for Micro Qualitative Analysis*, (2021). Department of Chemistry, St. Joseph's College, Tiruchirappalli 620002, (Private circulation).
2. Ganapragasm, N. S., & Ramamurthy, G. (2007). *Organic Chemistry Lab Manual* (2nd Ed.). S. Vishwanathan Printers and Publishers (P) Ltd.

Books for Reference:

1. Furniss, B. S., et al. (1984). *Vogel's Textbook of Practical Organic Chemistry* (7th Ed.). ELBS Longman.
2. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry* (2nd Ed.). Sultan Chand and Sons.

CO. No	CO–Statement	Cognitive Level (K –Level)
On successful completion of this course, students will be able to		
CO1	Understand the preliminary tests of organic qualitative analysis.	**K1**
CO2	Determine the presence and absence of elements such as N/S/X.	**K2**
CO3	Identify the functional group of the compounds from characteristic reactions.	**K3**
CO4	Confirm the functional group by preparing a solid derivative.	**K4**
CO5	Report their results of the organic analysis in a scientific way.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**				**Hours**		**Credits**	
5	**25UCH53CP05**			**Core Practical - 5:** Organic Analysis and Determination of Physical Constants				**8**		**3**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO–1	3	1	2	2	3	3	2	1	3	2	2.2
CO–2	2	2	2	3	2	2	1	3	3	2	2.2
CO–3	3	2	2	3	3	2	3	2	2	3	2.5
CO–4	2	3	2	3	2	3	3	2	3	2	2.5
CO–5	3	3	2	1	2	2	2	3	2	1	2.1
Mean overall Score											**2.3 (High)**

Scheme of Valuation

Core Practical - 5: Organic Analysis and Determination of Physical Constants

(A) Internal continuous assessment	**(100 marks)**
1. Regular Practical Sessions	**50** (Based on his observation and record notes)
2. CIA I + CIA II tests	**50** (conducted for 100 marks each and converted to 25 each)

Scheme for CIA tests I and II	**(100 mark each)**
1. Analysis	**50**
1. Acid/base/neutral	5
2. Aliphatic/aromatic	5
3. Saturated/unsaturated	5
4. Elements test	
i) Preparation	5
ii) Test for N present/absent	5
iii) Tests for S present/absent	5
iv) Tests for X present/absent	5
5. Functional group present	7.5
6. Preparation of derivative	7.5
2. Melting /Boiling point	**30**
3. Theory behind practicals – Test	**10**
4. Record note book	**10**

(B) Scheme for Semester examination	**(100 mark)**
1. Analysis	**60**
1. Acid/base/neutral	5
2. Aliphatic/aromatic	5
3. Saturated/unsaturated	5
4. Tests for elements	
i) Preparation	10
ii) Test for N present/absent	5
iii) Tests for S present/absent	5
iv) Tests for X present/absent	5
5. Functional group present	10
6. Preparation of derivative	10
2. Melting/Boiling point	**30**
Mp/bp less than or equal to 2 degrees	30
More than 2 and less than 5 degrees	20
More than 5 degrees	10
3. Theory behind practicals – Test	**10**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH53ES01A	**Discipline Specific Elective – 1:** Physical Chemistry - 1	4	3

Course Objectives
To recognize the principles of spectroscopy and electrolytic conductance
To understand the different spectroscopic techniques, electrodes and electrochemical cells
To apply the knowledge of spectroscopy and conductance in structure elucidation, construction of cells and writing cell reaction
To classify the spectroscopic, conductometric and potentiometric techniques
To justify the concepts of spectroscopy in structure elucidation and electrodics in construction of electrochemical cells and fuel cells

Unit I: Spectroscopy I (12 Hours)

The absorption and emission of radiation-selection rules and transition moments-Beer-Lambert law- spectral line widths-Doppler broadening-experimental techniques- molecular rotation-moments of inertia-rotational energy levels-microwave spectroscopy-selection rules-appearance of microwave spectra. UV-Visible spectroscopy-electronic spectra -types of electronic transitions-Fluorescence and phosphorescence-Jablonski diagram-intersystem crossing-internal conversion-Effect of solvents on electronic transitions. Frank-Condon principle-spectra of diatomic and polyatomic molecules- predissociation-dissociation energy-applications.

Unit II: Spectroscopy II (12 Hours)

Infrared spectroscopy-vibrational motion-anharmonicity-vibration-rotation spectra-selection rules-vibrational spectroscopy of diatomic and polyatomic molecules- normal modes-Infrared absorption spectra-vibrational Raman spectra-symmetry aspects of molecular vibrations-rotational Raman spectroscopy-nuclear statistics and rotational states-Infrared activity of normal modes-Raman activity of normal modes-Advances in spectroscopic instrumentation-Fourier Transform Spectroscopy (FTS). Applications of IR and Raman spectroscopy-Near-Infrared (NIR) and Far-Infrared (FIR) spectroscopy-applications.

Unit III: Electrochemistry (12 Hours)

Ohm's law-conductance in metals and electrolytic solution-specific conductance-equivalent conductance-measurement of equivalent conductance-Kohlrausch law and its applications-Arrhenius theory of electrolytic dissociation and its limitations-weak and strong electrolytes according to Arrhenius theory-Ostwald's dilution law, its uses and its limitations-elementary treatment of Debye-Huckel theory of strong electrolytes-transport number-determination of transport number-Hittorf's method and moving boundary method.

Unit IV: Conduction Measurement (12 Hours)

Applications of conductance measurements-determination of degree of dissociation-determination of Ka of acid-determination of solubility of sparingly soluble salt-common ion effect-conductometric titrations (acid-base and precipitation)-electrochemical cells-electrolytic cell-reversible and irreversible cells-conventional representation of electrochemical cells-single electrode potential-standard electrode potential-sign conventions-electrochemical series and its significance-EMF and its measurements-Weston-Cadmium standard cell-computation of cell EMF-relation between free energy and EMF-Gibbs Helmholtz equation and ΔH, ΔG, ΔE-calculations of thermodynamic quantities of cell reaction (S and K).

Unit V: Electrodes, Cells, Energy Storage and Conversion (12 Hours)

Types of reversible electrodes-gas/metal ion-metal/metal ion-metal/insoluble/anion-redox electrodes-standard hydrogen electrode and calomel electrode-electrode reaction-Nernst equation of electrode reaction-reference electrodes-concentration cells with and without transference-liquid junction potential–application of EMF measurements-valency of ions, solubility product, activity coefficient- potentiometric titration-determination of pH using hydrogen, quinhydrone and glass electrodes- determination of pKa of acids by potentiometry-energy conversion-dry cell, lead acid storage battery, H_2–O_2 fuel cell-Redox flow batteries-working and applications- advances in lithium-ion and sodium-ion batteries- Electrochemical energy storage-super capacitors and hybrid systems.

Teaching Methodology	Chalk and Talk, Video and PPT
Assessment Methods	Test, Snap test, Seminar.

Books for Study:

1. Banwell C N, Mc Cash E M, (2002). *Fundamentals of Molecular Spectroscopy*, (4th Ed.) McGraw–Hill Publishing Company Limited.
   Unit I and II
2. Laidler, K. J., & Meiser, J. H. (2006). *Physical Chemistry* (2nd Ed.). CBS Publishers & Distributors.
   Unit III, IV and V
3. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). Principles of Physical Chemistry (49th Ed.). Shoban Lal Nagin Chand & Co.
   Unit III, IV and V

Books for Reference:

1. Atkins P and Julio de Paula, (2014). *Physical Chemistry*, (10th Ed.) Oxford University Press.
2. Glasstone S, (2008). *An Introduction to Electrochemistry*, Affiliated East–West Press Pvt. Ltd.,
   Unit III, IV and V
3. Castellan G W, (1983). *Physical Chemistry*, (3rd Ed.) Addison–Wesley Publishing Company.
4. Bockris J OM, Reddy A K N, (2000). *Modern Electrochemistry 1 and 2A*, Kluwer Academic/ Plenum Publishers.

Websites and eLearning Sources:

1. Arrhenius Theory ofElectrolytic Dissociation Standard Hydrogen Electrode Hydrogen Oxygen Fuel Cell
2. NPTEL Online Courses (https://nptel.ac.in/)
3. MIT OpenCourseWare (https://ocw.mit.edu/)
4. Khan Academy (https://www.khanacademy.org/)

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Defining electrochemical and spectroscopy principles	**K1**
CO2	Under the basics of spectroscopy and electrochemistry	**K2**
CO3	Applying the principles of spectroscopic techniques and electrochemistry	**K3**
CO4	Construct electrodes galvanic cells and batteries	**K4**
CO5	Analyze spectroscopic and electrochemistry concepts	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UCH53ES01A**			**Discipline Specific Elective – 1:** Physical Chemistry - 1						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	1	2	3	1	2	3	2	3	3	**2.1**
CO2	2	3	2	3	2	2	3	2	1	1	**2.1**
CO3	1	4	3	3	2	2	3	1	2	3	**2.4**
CO4	1	3	2	4	3	2	2	3	3	2	**2.5**
CO5	2	2	2	3	2	2	1	3	1	3	**2.1**
Mean Overall Score											**2.21 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH53ES01B	**Discipline Specific Elective – 1:** Spectroscopy and Electrochemistry	4	3

Course Objectives
To recognize the principles of spectroscopy and electrolytic conductance and phase equilibria
To understand the different spectroscopic techniques, electrodes and electrochemical cells and phase equilibria
To apply the knowledge of spectroscopy and conductance in structure elucidation, construction of cells and writing cell reaction and phase equilibria
To classify the spectroscopic, conductometric and potentiometric techniques and phase equilibria.
To justify the concepts of spectroscopy in structure elucidation and electrodics in construction of electrochemical cells and fuel cells and phase equilibria.

UNIT I: Spectroscopy-I (12 Hours)

Basic aspects of spectroscopy - Atomic and molecular spectra - Characterization of electromagnetic radiation - Quantization of energy -Absorption and emission spectra – Microwave spectroscopy-Rotation of molecules and selection rules -Diatomic molecules - Rigid and non-rigid rotator - Intensities of spectral lines - Effect of isotopic substitution-Rotational constant (B) and centrifugal distortion constant (D) - Techniques and Instrumentation - Vibration spectroscopy - Harmonic and anharmonic oscillators - Zero point energy, dissociation energy and force constant (k). Fundamental absorption and overtones (Hot Bands; Fermi resonance) - Break down of Born -Oppenheimer approximation-Vibrations of polyatomic molecules - Fundamental vibrations and their symmetry - Influence of nuclear spin - Techniques and Instrumentation.

Unit II: Spectroscopy-II (12 Hours)

Raman spectroscopy - Raman and Rayleigh scattering - Quantum and classical theories of Raman effect - Molecular polarizabiltiy - Pure rotational Raman spectra - Stokes and antistokes lines - Vibrational Raman spectra-Mutual exclusion rule - Polarised and depolarized Raman lines - Techniques and instrumentation. Electronic spectra - Electronic spectra of diatomic molecules - Franck - Condon Principle, Dissociation energy determination and dissociation products - Pre dissociation – Birge Sponer extrapolation - Fortrate Diagram. Photo electron spectroscopy – Principle – UV and X-ray photo electron spectrometers-Molecular photoelectron spectroscopy – ESCA - Auger electron spectroscopy - Selected applications.

UNIT III: NMR, NQR and ESR spectroscopy (12 Hours)

NMR - Hydrogen nuclei - Chemical shift and spin - spin splitting - Coupling constant (J). Splitting with and without chemical exchange - Interaction between spin and magnetic field - Gyromagnetic ratio - FT NMR - Applications of 2D NMR techniques like COSY, NOESY.

Applications of C13 NMR spectroscopy. NQR principle and applications - ESR-Principle - Position of ESR absorptions - g value - Hyperfine splitting - Zero field splitting - ESR spectrum of free radicals and copper salicyaldehyde complexes.

Unit IV: Electrochemistry (12 Hours)

Ohm's law – conductance in metals and electrolytic solution – specific conductance – equivalent conductance – measurement of equivalent conductance – Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and its limitations – weak and strong electrolytes according to Arrhenius theory – Ostwald's dilution law, its uses and its limitations – elementary treatment of Debye–Huckel theory of strong electrolytes– transport number– determination of transport number–Hittorf's method and moving boundary method.

Unit V: Conduction Measurement and Electromotive Force (12 Hours)

Applications of conductance measurements– determination of degree of dissociation – determination of Ka of acid – determination of solubility of sparingly soluble salt–common ion effect–conductometric titrations (acid–base and precipitation)–electrochemical cells–electrolytic cell–reversible and irreversible cells–conventional representation of electrochemical cells–EMF and its measurements – Weston–Cadmium standard cell – computation of cell EMF–relation between free energy and EMF–Gibbs Helmholtz equation and ΔH, ΔG, ΔE – calculations of thermodynamic quantities of cell reaction (S and K).

Teaching Methodology	Chalk and Talk, Video and PPT
Assessment Methods	Test, Snap test, Seminar.

Books for Study:

1. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). *Principles of Physical Chemistry* (49th Ed.). Shoban Lal Nagin Chand & Co.
2. Banwell C N, Mc Cash E M, (2002). *Fundamentals of Molecular Spectroscopy*, (4th Ed.). McGraw–Hill Publishing Company Limited.
3. Bockris J O M, Reddy A K N, *Modern Electrochemistry 1 and 2A*, (2000). KluwerAcademic/Plenum Publishers.

Books for Reference:

1. Castellan G W, (1983). *Physical Chemistry*, (3rd Ed.). Addison–Wesley Publishing Company.
2. Atkins, P. W. and de Paula, J. *Physical Chemistry*, oxford University Press.

Websites and eLearning Sources:

1. NPTEL Online Courses (https://nptel.ac.in/)
2. MIT Open CourseWare (https://ocw.mit.edu/)

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Defining electrochemical and spectroscopy principles	**K1**
CO2	Under the basics of spectroscopy and electrochemistry	**K2**
CO3	Applying the principles of spectroscopic techniques and electrochemistry	**K3**
CO4	Construct electrodes galvanic cells and batteries	**K4**
CO5	Analyze spectroscopic and electrochemistry concepts	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UCH53ES01B**			**Discipline Specific Elective – 1:** Spectroscopy and Electrochemistry						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	1	2	3	1	2	3	2	3	3	**2.1**
CO2	2	3	2	3	2	2	3	2	1	1	**2.1**
CO3	1	4	3	3	2	2	3	1	2	3	**2.4**
CO4	1	3	2	4	3	2	2	3	3	2	**2.5**
CO5	2	2	2	3	2	2	1	3	1	3	**2.1**
Mean Overall Score											**2.21 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH53ES02A	**Discipline Specific Elective – 2:** Bioorganic chemistry	4	3

Course Objectives
To understand the structure of sugars and proteins
To learn the characteristic structural features and reactivity of nucleic acids and steroids
To comprehend the properties of disaccharides and polysaccharides
To comprehend the properties of fatty acids and enzymes
To learn the fundamentals and mechanism of drug action

UNIT I: Carbohydrates (12 Hours)

Introduction – classification – nomenclature –physical properties – glucose – cyclic structures – chemical properties – mutarotation – anomerism –epimerization –Kiliani–Fischer synthesis – Ruff degradation – fructose –cyclic structures–interconversion of ketose to aldose – conversion of glucose into ascorbic acid – disaccharides: lactose, maltose, cellobiose and sucrose (structures only) – structural differences between starch and cellulose –uses of cellulose and its derivatives.

UNIT II: Amino acids and Proteins (12 Hours)

List of amino acids – structures – preparation of amino acids – reactions of amino acids – synthesis of dipeptides: protection, activation and deprotection – Merrifield solid phase synthesis – classification of proteins – terminal residue analysis: N–terminal (Edman Pehr method) – C–terminal analysis (enzymatic and chemical) – Sanger method of identification of amino acid sequence in a polypeptide – primary, secondary and tertiary structures of proteins

UNIT III: Nucleic acids and Lipids (12 Hours)

Nucleic acids: Types of bases – types of sugars – nucleosides and nucleotides – types of nucleic acids – structure and functions of DNA and RNA.

Lipids: Fatty acids –waxes – fats and oils – membranes – phospholipids – spingolipids – prostaglandins.

UNIT IV: Alkaloids, Terpenoids, and Steroids (12 Hours)

Introduction to alkaloids – classification – occurrence and isolation – structural elucidation of papaverine and nicotine only – Structures of alkaloids: quinine, morphine, atropine, coniine, and piperine only – Classification and definition of terpenoids – isoprene rule – structure and uses of menthol, camphor and alpha-pinene. Structure and functions of steroids –androgen, esterogen and cholesterol only.

UNIT V: Vitamins and Antibiotics (12 Hours)

Vitamins – Types – Sources and deficiency disorders – Antibiotics – structure and functions of chloramphenicol, penicillins, streptomycein, tetracyclins – only definition of disinfectants, antiseptics, antipyretics, analgesics and antimalarials.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Morrison R T and Boyd R N, (2011). *Organic Chemistry*, (7th Ed.), Allyn and Bacon Ltd., **Unit I Unit II**
2. Bruice P Y, (2011). *Organic Chemistry*, (8th Ed.) Pearson Ltd **Unit III**
3. Finar I L, (1996). *Organic Chemistry*Vol: 1 and 2, (6th Ed.), Addison Wesley Longman Ltd. **Unit IV**
4. Jayashree Ghosh, (2006*). Fundamental Concepts of Applied Chemistry*, (2nd Ed.) S. Chand and Co.Ltd. **Unit V**

Books for Reference:

1. Stryer L, Berg J M, Tymoczko J L and Gatto G, (2019). *Biochemistry*, (9th Ed.), W. H. Freeman andCompany
2. Rodwell D, Bender D and Botham K, Harper, (2018). *Illustrated Biochemistry*,(31st Ed.), McGraw Hill Professional

Websites and eLearning Sources:

Biomolecules – Khan Academy

Biomolecules - PDF

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand the chemistry of carbohydrates and proteins	**K1**
CO2	Comprehend the preparations and characteristic reactions of poly-peptides and fundamental process of drug delivery system	**K2**
CO3	Examine the reactivity, orientation, and mechanism of enzymatic reactions	**K3**
CO4	Predict the structure and heterocyclic core of alkaloids	**K4**
CO5	Determine the properties of lipids and fats and various processes in citric acid cycle	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
5	**25UCH53ES02A**			**Discipline Specific Elective – 2:** Bioorganic chemistry					**4**	**3**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	2	2	2	3	2	1	2.1
CO2	3	1	2	2	3	3	2	1	3	2	2.2
CO3	2	1	2	3	2	3	1	2	3	2	2.1
CO4	2	2	1	3	2	2	1	2	3	2	2.0
CO5	3	2	2	3	3	2	3	2	2	3	2.5
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH53ES02B	**Discipline Specific Elective – 2:** Pharmaceutical Chemistry	4	3

Course Objectives
To understand the classification and nomenclature of drugs.
To interpret the action of drugs based on their structures.
To demonstrate the different types of diseases and their treatment.
To summarize the uses of chemotherapeutic drugs for the treatment of diseases.
To mark the pharmacodynamic functions of cardiovascular drugs.

UNIT I: Introduction to Chemistry of Drugs (12 Hours)

Drugs – definition– sources– study of drugs –classification (biological, chemical, commercial and utility)– nomenclature of drugs– biotransformation–drug design – factors affecting the stability of drugs– encapsulation – drug delivery systems and sustained release of drugs.

UNIT II: Drugs Containing Heterocycles (12 Hours)

Structures and their therapeutic uses of drugs containing pyridine: nikethamide, isoniazid, mepyramine and niacin–thiazole: niridazole, thiabendazole and sulfathiazole – imidazole: azomycin, metronidazole and clotrimazole – indole: seratonine, reserpine, ergotamine and indomethacin– quinoline: chinofon, chloroquine and primaquine.

UNIT III: Common Diseases and their Treatment (12 Hours)

Insect borne diseases – Treatment using drugs – Air borne diseases–Treatment using drugs – water borne diseases– Treatment using drugs–Digestive disorders – treatment– diseases of respiratory system– treatment– diseases of nervous system – treatment – other common diseases– treatment.

UNIT IV: CNS Drugs (12 Hours)

General Anaesthetics: Intravenous anaesthetics, mechanism of anaesthetic action. Hypnotics and Sedatives: Classification, chemistry, pharmacological actions, pharmacokinetics and adverse affects of barbiturates, benzodiazepines, BZD antagonist. Antiparkinsonism drugs: Dopamine replacements, dopamine releasers, dopamine agonists. Anticonvulsant Drugs: Barbiturates, hydantoins, oxazolidinediones, succinimides.

UNIT V: Bioregulatory Drugs (12 Hours)

Cardiovascular drugs – Cardiac glycosides – anti arrhythmic drugs –antihypertensive agents –antianginal agents. Diabetes and Hypoglycaemic drugs – two types of diabetes – Diabetes insipidus and diabetes mellitus –Control of diabetes – Insulin –Hypoglycaemic agents. Anticonvulsants –Cancer and antineoplastic drugs – Common causes – antimetabolites.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Clayden J, Greeves N and Warren S, (2012). *Organic Chemistry*, (2nd Ed), Oxford University Press. **Unit I & II**
2. Gosh J, (1997). *Text Book of Pharmaceutical Chemistry*, (3rd Ed), S. Chand & Chand Publications. **Unit I, III & V**
3. George M and Joseph L, (2009). *Text Book of Pharmaceutical Chemistry*, Viva Books **Unit IV**

Books for Reference:

1. Srivastava, S K, (2012). *A Complete Text Book of Medical Pharmacology*, Volume I& II (2nd Ed.). Avichal Publishing Company.
2. Deb A C, (1994). *Fundamentals of Biochemistry*, New Central Book Agency, Calcutta.
3. Satake M and Mido Y, (2003). *Chemistry for Health Science*, Discovery Publishing House
4. Kar A, (1993). *Medicinal Chemistry*, Wiley Easterns Limited.

Websites and eLearning Sources:

1. http://digimat.in/nptel/courses/video/104106106/L02.html
2. https://archive.nptel.ac.in/courses/104/105/104105034/
3. https://onlinecourses.nptel.ac.in/noc24_ge52/preview

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Understand the fundamental concepts of drugs and drug design	**K1**
CO2	Explain the nature of diseases and their drugs	**K2**
CO3	Describe pharmaceutical aids and treatments	**K3**
CO4	Classify the types of drugs based on their activity	**K4**
CO5	Apply assimilated knowledge to explain the various mechanisms of action of drugs	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
5	**25UCH53ES02B**			**Discipline Specific Elective – 2:** Pharmaceutical Chemistry					**4**	**3**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	2	2	2	2	2	2	**2.0**
CO2	2	1	2	2	2	2	2	2	2	2	**1.9**
CO3	3	2	2	2	1	3	2	2	2	2	**2.1**
CO4	2	2	2	2	1	1	2	2	2	2	**1.8**
CO5	3	2	2	2	2	3	2	2	2	2	**2.2**
										Mean Overall Score	**2.0 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH54OE01	**Open Elective – 1 (WS):** Everyday Chemistry	4	2

Course Objectives
To identify the different food adulterants, sugar, oils and fats.
To discuss the calorific values of various fuels and harmful effects of adulterants.
To apply the knowledge of role and function of water in biological Systems.
To demonstrate the preparation of simple cosmetics, sugar, oils and fats.
To analyze the functioning of rocket fuel cells and fractional distillation of coal tar.

Unit I: Aims of Food Science and Role of Water in Biological Systems (12 Hours)

World Food Requirement – Food Safety for the Consumer nutrition – Basic chemical constituents of food – Food borne diseases.

Role and Function of water in Biological Systems – Dietary requirements and sources – Physical properties of water – Solute-water interactions.

Size Reduction – Screening – Mixing – Emulsification – Filtration – Centrifugation – Extraction – Crystallization

Unit II: Oils, Fats and Sugar (12 Hours)

Distinction between oils and fats – properties – classification – edible oils – vegetable oils – animal oils – manufacture of oils by solvent extraction – refining of crude vegetable oils – processing of animal fats – manufacture of cane sugar – extraction and purification – defection, sulphitation and carbonation – evaporation – crystallization – separation of crystals – refining – manufacture of sucrose from beet root.

Unit III: Adulterants in food (12 Hours)

Food Adulteration and prevention – common food adulterants – food additives – food colorants– preservatives – flavourants – food poisoning – analysis of adultrants in edible oils, coffee powder, chilli powder, turmeric powder, meat, fish, ghee and milk – harmful effects of food adulterants.

Unit IV: Fuels and fuel cells (12 Hours)

Modern concept of fuels – classification of fuels – criterion of selection of fuels – natural and artificial solid fuels – calorific value – properties of fuels – advantages of solid fuels over liquid and gaseous fuels – natural gas and LPG – coal and coke – fractional distillation of crude oil – chemistry of fuel cells – examples – hydrogen-oxygen fuel cells in manned spacecrafts – advantages – Fuel cells: The future of clean energy.

Unit V: Cosmetics (12 Hours)

Cosmetics– definition – types of cosmetics – composition of cosmetics – methods of preparation of soap, detergent, face powder, nail polish, deodorants, hair dyes, shampoo, perfumes and face creams – their side effects.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Multiple choice questions, Open book test, assignment, seminar, snap test

Books for Study:

1. Alex V Ramani. (2009). *Food Chemistry*, MJP Publishers.
   Unit - I*Chapter3*
   Unit - III *Chapter 8 and 9*
2. Sharma, B. K. (2011). *Industrial Chemistry*, Goel publishing house.
   Unit - II *Chapter 38 and 39*
   Unit - IV *Chapter 4 and 16*
3. Benson Heather, A. E. (2019). *Cosmetic Formulation: Principles and Practice*, Taylor and Francis, New York, 2019.
   Unit - V *Chapter 7 and 13*

Books for Reference:

1. Ashutosh Kar. (1993). *Medicinal Chemistry*, Wiley Eastern limited.

2. Maison G. De Navarre. (2009). *The chemistry and manufacture of Cosmetics*, Allured books.
3. Jindal, S. P. (2007). *Food Adulteration and Food Safety,(*1st Ed.). Discovery Publishing House.
4. Agarwal, B. K. (2009). *Fuels and Combustion, (*3rd Ed.). Khanna Publishers.
5. Sharma, B. K. (2006). *Water Quality and Treatment, (*1st Ed.). Khanna Publishers.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=BD_fpgki5QA
2. https://www.youtube.com/watch?v=PYMWUz7TC3A
3. https://www.youtube.com/watch?v=2Z2pmlB60lI
4. https://www.youtube.com/watch?v=dwJi1m1n1IU
5. https://www.youtube.com/watch?v=EGJJf6ME7KI

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Identify the different food adulterants, sugar, oils and fats.	**K1**
CO2	Discuss the calorific values of various fuels and harmful effects of adulterants.	**K2**
CO3	Apply the knowledge of role and function of water in biological Systems.	**K3**
CO4	Demonstrate the preparation of simple cosmetics, sugar, oils and fats.	**K4**
CO5	Analyze the functioning of rocket fuel cells and fractional distillation of coal tar.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UCH54OE01**			**Open Elective – 1 (WS):** Everyday Chemistry						**4**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	3	2	3	2	**2.5**
CO2	3	2	3	3	1	3	3	3	3	2	**2.6**
CO3	3	2	3	3	3	3	2	2	3	2	**2.6**
CO4	3	3	2	2	1	3	3	2	3	2	**2.4**
CO5	3	3	3	3	1	3	3	3	2	2	**2.6**
										Mean Overall Score	**2.5 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UCH54SL04	**Certificate Course:** Basics of Instrumental Methods	-	2

Course Objectives
To understand the different types of instrumental methods
To know the principles behind various instrumental techniques
To solve numerical problems
To acquire knowledge about uv-visible and FTIR spectrometer
To learn the advantages and impact of advanced spectroscopic methods

Unit I: Introduction to Instrumental Measurements

Classical Methods-Instrumental Methods-Types of Instrumental Methods-Chemical and Physical Properties Used in Instrumental Methods-Detectors, Transducers, and Sensors-Calibration of Instrumental Methods.

Unit II: Principles of Instrumental Measurements

Comparison with Standards-Direct Comparison-Titrations-External-Standard Calibration-The Least-Squares Method-Selecting an Analytical Method-Defining the Problem-Performance Characteristics of Instruments-Precision-Sensitivity-Detection Limit-Numerical Problems.

Unit III: Atomic Absorption and Atomic Emission Spectrometry

Sample Atomization Techniques-Flame Atomization-Flame Structure-Flame Atomizers-Electrothermal Atomization-Electrothermal Atomizers-Output Signal-Atomic Absorption Instrumentation-Atomic Absorption Analytical Techniques-Atomic Fluorescence Spectroscopy- Emission Spectroscopy Based on Plasma Sources- The Inductively Coupled Plasma Source-Applications, Numerical Problems.

Unit IV: Essential Molecular Spectroscopic techniques

Interaction of electromagnetic radiation with matter- the electromagnetic spectrum- how does matter absorb radiation?-types of transitions- what happens to the absorbed radiation?- electronic spectra and molecular structure- kinds of transitions- absorption by isolated chromophores- absorption by conjugated chromophores- absorption by aromatic compounds- inorganic chelates: how do they absorb so intensely? absorption of infrared radiation- infrared spectra infrared spectral databases—identifying unknowns recording and characterizing a sample with uv-visible spectrometer. recording and characterizing a sample with uv-visible and FTIR spectrometer.

Unit V: Advanced spectroscopic methods

Theory of Fluorescence and Phosphorescence, Singlet and Triplet Excited States, Excited States Producing Fluorescence and Phosphorescence, Rates of Absorption and Emission, Variables Affecting Fluorescence and Phosphorescence. Recording and characterizing a sample with fluorescence spectrometer.

Teaching Methodology	Videos, PPT, demonstration, and visits to instrumentation facility
Assessment Methods	MQC Test, Viva Voce, Interpretation of spectra, Inquiry-based learning

Books for Study:

1. Skoog, D. A., Holler, F. J. and Crouch, S. R. (2017) *Principles of Instrumental Analysis*, (7th Ed.), Cengage Learning.
2. Christian, G. D. (2003). *Analytical chemistry* (6th Ed.). Wiley.
3. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry* (9th Ed.). Brooks/Cole Cengage Learning.
4. Silverstein R M, Bassler, G C, (1993), *Spectrometric Identification of Organic Compounds*, (4th Ed.). John- Wiley and Sons.
5. Jeffery, G. H., Bassett, J., Mendham, J. & Denney R. C. (1989) *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.), Longman Scientific and Technical.

Books for Reference:

1. Ewing, G. W. (1985). *Instrumental methods of chemical analysis* (5th Ed.). McGraw-Hill.

2. Willard, H. H., Merritt, L. L., Dean, J. A., & Settle, F. A. (1988). *Instrumental methods of analysis* (7th Ed.). CBS Publishers.
3. Khopkar, S. M. (2008). *Basic concepts of analytical chemistry* (3rd Ed.). New Age International.
4. Hollas, J. M. (2004). *Modern spectroscopy* (4th Ed.). Wiley.
5. Welz, B., & Sperling, M. (1999). *Atomic absorption spectrometry* (3rd Ed.). Wiley-VCH.

Websites and e-Learning Sources:

1. https://ocw.mit.edu/courses/chemistry/
2. https://nptel.ac.in/courses/104/108/104108124/
3. https://edu.rsc.org/resources

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Explain the fundamental principles of instrumental methods of chemical analysis by distinguishing between classical and instrumental techniques and understanding the role of detectors, transducers, and sensors.	**K1**
CO2	Apply calibration methods and statistical tools such as external standard calibration and least-squares analysis to ensure accuracy and precision in instrumental measurements.	**K2**
CO3	Demonstrate knowledge of atomic absorption and atomic emission spectrometry by describing sample atomization techniques, instrumentation, and applications in analytical chemistry.	**K3**
CO4	Analyze molecular spectroscopic techniques by interpreting UV-Visible, infrared, and fluorescence spectra and understanding their applications in structural elucidation and material characterization.	**K4**
CO5	Evaluate advanced spectroscopic techniques such as fluorescence and phosphorescence spectroscopy, and apply them to qualitative and quantitative analysis in research and industrial applications.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
5	**25UCH54SL04**	**Certificate Course:** Basics of Instrumental Methods								-	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	3	2	1	3	3	2.3
CO2	2	1	1	2	3	3	3	3	2	1	2.1
CO3	2	3	3	1	2	1	3	3	3	3	2.2
CO4	2	3	2	2	2	3	3	3	1	1	2.1
CO5	3	3	1	2	2	3	3	2	2	3	2.2
										Mean Overall Score	**2.18 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63CC10	**Core Course - 10:** Inorganic Chemistry - 2	5	4

Course Objectives
To understand the chemistry of lanthanides and actinides.
To predict the reactivities of complexes and compare the different pathways they follow when they react.
To understand and explain the electronic spectral of coordination complexes.
To know the structure and bonding in organometallic complexes.
To predict the role of different metal ions in biological systems.

UNIT I: *f*-Block Elements (15 Hours)

The Lanthanide Series

Abundance, extraction and uses - Separation of the lanthanide elements – precipitation, thermal reaction, fractional crystallization, complex formation, solvent extraction, valency change, ion-exchange - Electronic structure - Oxidation states, solubility, color and spectra, magnetic properties, lanthanide contraction, complexes

The Actinide Series

Electronic structure and position in the periodic table - Actinide contraction- Oxidation states - Occurrence and preparation of the elements

UNIT II: Reactions of Coordination Complexes (15 Hours)

Ligand substitution reactions –Kinetically inert and labile complexes - Types of substitution mechanism - Activation parameters. Substitution in square planar complexes - Rate equations, mechanism and the trans-effect. Substitution and racemization in octahedral complexes - Water exchange - The Eigen–Wilkins mechanism - Stereochemistry of substitution. Base-catalysed hydrolysis - conjugate–base mechanism - Isomerization and racemization of octahedral complexes. Electron-transfer processes - Inner-sphere mechanism - Outer-sphere mechanism.

UNIT III: Electronic Spectra of Coordination Complexes (15 Hours)

Energy levels in atoms - coupling of orbital momenta - coupling of spin momenta - spin -orbit coupling - terms and term symbols - determining the ground state terms - Hund's rules - hole formulation - terms arising from *p* and *d* configurations (derivations of terms not required) - calculation of number of microstates. Electronic spectra of transition metal complexes - selection rules and intensity - interpretation of electronic spectra of high-spin d^1-d^9 systems with the help of Orgel diagrams

UNIT IV: Organometallic Chemistry (15 Hours)

Hapticity of ligands. Common types of ligands and bonding - σ-Bonded alkyl, aryl and related ligands - Carbonyl ligand, its bonding and different modes of coordination - Hydride ligands - Phosphane and related ligands - π-Bonded organic ligands – structure and bonding in Zeise's salt – nitrogen monoxide – dinitrogen – dihydrogen. The 18-electron rule – Metal-metal bonding and 18 electron rule.

UNIT V: Bio-Inorganic Chemistry (15 Hours)

Metal ions in biology and their vital role in the active site, structure and functions of metalloproteins and enzymes- ion transport mechanism in cell membrane - Na and K pumps - ionophores - structures and characteristic features of haemoglobin and myoglobin - Vitamin B_{12} - blue copper proteins.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Lee, J. D. (1996). *Concise Inorganic Chemistry,* (5th Ed.). Blackwell Science Ltd.
   Units I and III
2. Housecroft, C. E., & Sharpe, A.G. (2018). *Inorganic Chemistry,* (5th Ed.), Pearson Education, New York.
   Units II, IV and V

Books for Reference:

1. Purcell, K. F., & Kotz, J. C. (2010). *Inorganic Chemistry*. Cengage Learning.
2. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). *Inorganic Chemistry Principles of Structure and Reactivity*, (4th Ed.). Harper Collins College Publishers.
3. Weller, M., Overton, T., Rourke, J., and Armstrong, F., *(2018). Inorganic Chemistry* (7th Ed.), Oxford University Press, Oxford, UK.
4. Cotton, F. A., Wilkinson, G., & Gauss, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John Willey and Sons. Inc.
5. Miessler, G.L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry* (5th Ed.), Pearson Education, New York.

Websites and eLearning Sources

1. https://onlinecourses.nptel.ac.in/noc19_cy19/preview
2. https://onlinecourses.nptel.ac.in/noc23_cy01/preview
3. https://onlinecourses.nptel.ac.in/noc22_cy12/preview
4. https://onlinecourses.nptel.ac.in/noc22_cy60/preview

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Describe the properties of inner transition elements.	**K1**
CO2	Outline the basics of reactions of complexes.	**K2**
CO3	Correlate the electronic transition and structure of complexes.	**K3**
CO4	Predict the structure and stability of organometallic complexes.	**K4**
CO5	Describe the role of transition metal ions in biological systems.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
6	**25UCH63CC10**		**Core Course - 10:** Inorganic Chemistry - 2							**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	1	3	3	2	2	3	2	**2.3**
CO2	3	3	2	2	1	2	2	3	2	2	**2.2**
CO3	3	3	2	2	3	3	1	2	2	2	**2.3**
CO4	3	1	2	2	3	1	2	2	3	2	**2.1**
CO5	3	2	2	2	2	2	2	2	3	2	**2.2**
Mean Overall Score											**2.22 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63CC11	**Core Course - 11:** Physical Chemistry - 2	5	4

Course Objectives
To recognize the principles of chemical kinetics, catalysis, photochemical reaction, group theory and polymerization
To understand the different types of kinetics, catalysis, surface reaction and polymerization theories
To apply the knowledge of kinetics, catalysis, adsorption, photochemical reaction, grouptheory and polymerization in designing new processes and structure
To analyse the techniques of catalysis, adsorption, photochemical reactions and polymerization
To justify the concepts of kinetics, catalysis, adsorption, photochemical reaction, group theory and polymerization

Unit I: Chemical Kinetics I (15 Hours)

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – Factors influencing the rate of a reaction – Derivations of rate constants for Zero, first and second order reactions – Fractional order reactions – Half-life period – Pseudo first order reactions and examples – Methods of determination of order of a reaction (Integration, graphical, half-life, Ostwald's dilution method, experimental). Note: Numerical problems wherever possible.

Unit II: Chemical Kinetics II (15 Hours)

Steady state approximation - Chain reactions and explosion reaction - Temperature dependence of reaction rates – Arrhenius parameters. Theories of reaction rates – simple collision theory – limitations - Lindmann's hypothesis of unimolecular reactions – Theory of absolute reaction rates – influence of ionic strength on reaction rate. Note: Numerical problems wherever possible

Unit III: Chemical Kinetics III (15 Hours)

Homogeneous and Heterogeneous catalysis – Acid-base catalysis, enzyme catalysis – Michaelis Menten equation – Adsorption - heat of adsorption – factors influencing adsorption- physical adsorption and chemical adsorption – Adsorption of Gas by solids – Langmuir theory of adsorption – unimolecular surface reaction – Bimolecular surface reaction. Freundlich adsorption isotherm – Gibbs adsorption isotherm for adsorption of solutions. Note: Numerical problems wherever possible

Unit –IV Kinetics of Photochemical Reactions (15 Hours)

Thermal chain reactions – H_2–Br_2 reaction – dissociation of acetaldehyde – comparison of thermal and photochemical chain reactions- photochemical reactions – laws of photochemistry – quantum yield –primary and secondary process – HI decomposition – HBr decomposition – kinetics of hydrogen– bromine reaction – kinetics of hydrogen – chlorine reaction – photochemical equilibrium– photo dimerization of anthracene – photosensitizations – chemiluminescence –phosphorescence.

Unit V: Group Theory and Polarization (15 Hours)

Symmetry operations and symmetry elements – the symmetry classification of molecules – groups – consequences of symmetry – polarity – chirality – symmetry operations – point group.

Polarization of molecules in an electric field – polarizability and dipole moment – induced and orientation polarization – Clausius-Mossotti equation – applications of dipole moment measurement and molar polarization.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Laidler, K. J., & Meiser, J. H. (2006). *Physical Chemistry* (2nd Ed.). CBS Publishers & Distributors.
2. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). *Principles of Physical Chemistry* (49th Ed.). Shoban Lal Nagin Chand & Co.
   Unit- I, II, III, IV, V
3. Sharma B.K. (2014). *Industrial Chemistry,* (17th Ed.). Krishan Prakashan.

Books for Reference:

1. Atkins P. W. (2009). *Physical Chemistry*, (7th Ed.) Oxford University Press.
2. Castellan G.W. (1987). *Physical Chemistry*, (3rdEd.), Orient Longmann.
3. Cotton, F. A. (1990). *Chemical Applications of Group Theory*,(3rd Ed.). John Wiley and Sons.

Websites and eLearning Sources:

1. An Introduction to Chemical Kinetics
2. Unimolecular and Bimolecular surface reactions
3. mod01lec02 - Symmetry Elements and Operations - Part 1
4. Mod-01 Lec-01 Introduction to Polymers

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Describe the principles of kinetics, catalysis adsorption, photochemical reaction, group theory and polymerization	**K1**
CO2	Understand the basics of kinetics, catalysis, adsorption, photochemical reaction, group theory and polymerization	**K2**
CO3	Apply the concepts of kinetics, catalysis, adsorption, photochemical reaction and polymerization	**K3**
CO4	Analyse the kinetic parameters, adsorption isotherms, photochemical aspects, symmetry aspects of group theory and mechanism of polymerization	**K4**
CO5	Compare the different kinetics, adsorption, photochemical and polymerization techniques	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UCH63CC11**			**Core Course - 11:** Physical Chemistry - 2						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	3	2	2	2	2	2	3	**2.3**
CO2	2	1	2	3	1	2	2	3	1	3	**2.0**
CO3	2	2	2	3	2	2	2	2	2	2	**2.1**
CO4	2	1	2	3	2	2	3	2	3	3	**2.3**
CO5	1	2	2	2	3	1	2	3	2	2	**2.0**
										Mean Overall Score	**2.14 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63CP06	**Core Practical – 6:** Gravimetric Analysis and Preparation of Organic Compounds	8	3

Course Objectives
To learn the principles and methods of gravimetry
To learn the methods of organic preparations
To apply the techniques of gravimetric analysis
To describe the techniques for single stage preparation of organic compounds
To understand the techniques in recrystallization

Unit I: Theory of Gravimetry **(10 Hours)**

Principles of quantitative precipitation – conditions for precipitation –methods of digestion – quantitative filtrations – techniques of drying –theory of weighing – scientific reporting.

Unit II: Theory of Organic Preparations **(10 Hours)**

Principles of chemical conversions – Handling of organic chemicals and glassware – filtration techniques – drying techniques – distillation techniques– recrystallization techniques – scientific reporting.

Unit III: Gravimetric Estimations–I **(40 Hours)**

1. Estimation of Lead as Lead Chromate
2. Estimation of Barium as Barium chromate
3. Estimation of Nickel as Nickel–DMG complex
4. Estimation of Copper as Copper (I) thiocyanate

Unit IV: Gravimetric Estimations–II **(40 Hours)**

1. Estimation of Magnesium as Magnesium oxinate
2. Estimation of Calcium as Calcium oxalate
3. Estimation of Barium as Barium sulphate
4. Estimation of Iron as Iron (III) oxide

Unit V: Some Organic Preparations **(20 Hours)**

Preparation of Organic compounds involving the following reactions:

1. Hydrolysis
2. Esterification
3. Nitration
4. Bromination
5. Oxidation
6. Diazotization
7. Osazone formation

Teaching Methodology	Laboratory Demonstration
Assessment Methods	Test, viva voce

Books for Study:

1. *Laboratory Manual*, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli –2

Books for Reference:

1. Jeffery G. H, Bassett J, Mendham J and Denney R. C, (1989) *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.), Longman Scientific and Technical, Essex, England.
2. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, (1989) *Vogel's Textbook of Practical Organic Chemistry*, (5th Ed.), Longman Scientific and Technical, Essex, England.
3. Skoog D. A, West D. M, Holler F J, and Crouch S R, (2014) *Fundamentals of Analytical Chemistry*, (9th Ed.), Brooks/Cole Cengage Learning, Belmont, CA 94002–3098, USA.

Websites and eLearning Sources:

1. https://edu.rsc.org/resources/gravimetric–analysis–practical–videos–16–18–students/4012297.article

Practical Videos

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Relate organic preparatory methods with syntheses in pharmaceutical industries.	**K1**
CO2	Explain principles of precipitation and gravimetric analysis.	**K2**
CO3	Use organic chemicals and other equipments in laboratories.	**K3**
CO4	Communicate and explain the acquired analytical knowledge as team members.	**K4**
CO5	Investigate the metal content of some metals using thermogravimetry.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
6	**25UCH63CP06**		**Core Practical – 6:** Gravimetric Analysis and Preparation of Organic Compounds						**8**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	2	2	3	2	3	2	**2.4**
CO2	2	2	2	2	2	2	2	2	2	2	**2.0**
CO3	1	2	1	2	2	1	2	1	2	2	**1.6**
CO4	2	2	1	2	2	2	2	1	2	2	**1.8**
CO5	3	2	2	2	2	3	2	2	2	2	**2.2**
Mean Overall Score											**2.0 (Medium)**

SCHEME OF VALUATION

Core Practical – 6: Gravimetric Analysis and Preparation of Organic Compounds

INTERNAL

CIA	**100 Marks**
Cumulative mark of Regular Practical Classes	50 Marks
Two CIA tests	50 Marks

For Each CIA Test	***100 marks***
Test	10 marks
Record	10 Marks
Results	80 Marks (50 Marks for Gravimetry and 30 marks for Preparation)

Scheme of valuation

Gravimetry		***Preparation***	
<2% Error	50 Marks	Crude	20 marks
3%	40 Marks	Recrystallization	10 marks
4%	30 Marks		
>4%	20 Marks		

EXTERNAL

Total	**100 Marks**
Short test	10 Marks
Results/Analysis	90 Marks (60 Marks for Gravimetry and 30 marks for Preparation)

Scheme of valuation

Gravimetry		***Preparation***	
<2% Error	60 Marks	Crude	20 marks
3%	50 Marks	Recrystallization	10 marks
4%	40 Marks		
>4%	20 Marks		

A Minimum of 7 Gravimetric experiments, 5 melting and 5 boiling point determinations might have been done in regular classes

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63ES03A	**Discipline Specific Elective – 3:** Organic Chemistry - 2	4	3

Course Objectives
To understand the principle, instrumentation and applications of UV–Vis and IR spectroscopy.
To comprehend the importance of NMR and Mass spectral techniques in structural elucidation.
To identify the structure of compounds from spectral data.
To analyze the favourable reactions reaction conditions for pericyclic reactions
To understand the types and mechanism of photochemical reactions.

UNIT I: Pericyclic and Photochemical Reactions (12 Hours)

Pericyclic reactions: Characteristics and types – FMO of enes, dienes and polyenes – electrocyclic reactions – Woodward–Hoffman rules for thermal and photochemical reactions – cycloaddition reactions– [4+2] and [2+2] – stereo– and regiochemistry – inverse electron demand and retro Diels–Alder reactions – sigmatropic rearrangements – types and examples – Alder–ene reactions and cheletropic reactions.

Photochemical reactions: Types of photochemical reactions– Norrish type I and II – Paterno –Buchi reaction – mechanism and stereochemistry.

UNIT II: UV–Visible Spectroscopy (12 Hours)

Electromagnetic spectrum – Energy wavelength relationship, UV–Visible spectroscopy: electronic transitions – principle –types of electronic transitions - instrumentation – chromophores, auxochromes – factors influencing absorptions – conjugation – solvent effect – shifts in absorptions – absorption bands in carbonyl compounds – Woodward–Fieser rules for the calculation of λ_{max} of dienes and enones.

UNIT III: IR Spectroscopy (12 Hours)

IR spectroscopy: Hooke's Law – sample handling – modes of vibrations in organic molecules –factors influencing stretching frequency – hybridization, tautomerism, H–bonding, electronic and steric and ring size effects – IR spectra of functional groups – hydrocarbons: methyl, methylene, methine C–H stretching in alkanes and cycloalkanes – alcohols, ethers, halogen, aldehydes, ketones, amines, esters – comparison of stretching frequency in carbonyl compounds – NH stretching in primary and secondary amines

UNIT IV: NMR Spectroscopy (12 Hours)

^{1}H NMR: principle, instrumentation, number of signals, shielding and deshielding – chemical shift: calculation, factors influencing chemical shifts – hybridization, electronic and steric effects peak – shielding and deshielding – exchangeable protons – integration and proton counting, spin–spin coupling and coupling constants – deuterated solvents – interpreting the NMR spectra of some organic molecules.

^{13}C NMR spectroscopy – types of carbon, splitting and chemical shift values for various types carbons

UNIT V: Mass Spectrometry and Combined Problems (12 Hours)

Mass spectrometry: principle – instrumentation – ionization techniques – CI and EI – desorption techniques – m/z values – molecular ion peak – isotopic peaks – [M+1] and [M+2] and their importance – metastable ions – factors affecting the fragmentation: branching, cyclic and acyclic compounds, benzylic and allylic cleavages – nitrogen rule, McLafferty rearrangement – interpretation of the mass spectra of some organic molecules. Combined approach to identify the structure of organic molecules.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Multiple choice questions, seminar, assignment, snap test

Books for Study:

1. Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, (2015), Introduction *to Spectroscopy*, (4thEd.), Cengage Learning.
   - **Unit–II** *Chapter* 7
   - **Unit–III** *Chapter* 33
   - **Unit-IV** *Chapters 3 & 4*
   - **Unit-V** *Chapters 8 & 9*

2. Silverstein R M and Bassler G C, (1993), *Spectrometric Identification of Organic Compounds*, (4th Ed.), John– Wiley and Sons.
Unit–II *Chapter 12*
3. Clayden J, Greeves N and Warren S, (2001), *Organic Chemistry*, (1st Ed.), Oxford University Press.
Unit–I *Chapters* 35 & 36

Books for Reference:

1. Kemp W, (1987), *Organic Spectroscopy*, (3rd Ed.), ELBS.
2. Fleming I, (1988), *Spectroscopic Methods in Organic Chemistry*, (4th Ed.), Tata–McGraw Hill Publishing Company.
3. Sharma Y R, (2013), *Elementary Organic Spectroscopy*, (5th Ed.), S. Chand & Company Pvt. Ltd.
4. Carey F A and Sundberg R J, (2007), *Advanced Organic Chemistry, Part A: Structure and mechanisms*, (5th Ed.), Springer Pvt. Ltd.
5. Carey F A and Sundberg R J, (2007), *Advanced Organic Chemistry, Part B: Structure and mechanisms*, (5th Ed.), Springer Pvt. Ltd.
6. Morrison R T and Boyd R T, (2011), *Organic Chemistry*, (7th Ed.), Allyn & Bacon Ltd.
7. Bruice P Y, (2011), *Organic Chemistry*, (8th Ed.), Pearson Ltd.
8. Pine S H, (1986), *Organic Chemistry*, (4th Ed.), McGraw–Hill International Book Company.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=oio3RJHAxOw
2. https://onlinecourses.nptel.ac.in/noc20_cy08/preview

Fundamentals of Spectroscopy

Pericyclic Reactions

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Describe the principle and applications of IR and UV-Visible spectral techniques	**K1**
CO2	Interpret the NMR and Mass spectra using spectra data	**K2**
CO3	Illustrate and solve combined spectral problems	**K3**
CO4	Identify the unknown compounds using spectral techniques	**K4**
CO5	Evaluate the types and mechanism of pericyclic and photochemical reactions	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
6	**25UCH63ES03A**			**Discipline Specific Elective – 3:** Organic Chemistry - 2					**4**	**3**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	1	2	3	3	2	2	2	**2.2**
CO2	2	1	2	1	2	2	2	1	3	1	**1.7**
CO3	3	3	2	2	1	3	3	1	3	1	**2.2**
CO4	3	3	3	2	1	3	3	1	3	2	**2.4**
CO5	3	3	3	3	1	3	2	1	3	1	**2.3**
Mean Overall Score											**2.16 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63ES03B	**Discipline Specific Elective – 3:** Health Science	4	3

Course Objectives
To understand the physical and mental well beings
To describe the classification of drugs and their mode of action
To analyse the composition of blood and their functions
To illustrate the biological functions of enzymes and hormones
To discuss the causes of common diseases and their treatments

UNIT I: Health (12 Hours)

Health – mental health and physical health – food pyramid – types of malnutrition – causes and remedies – macro and micronutrients – carbohydrates – classification and their biological functions, proteins– classification and their biological functions, vitamins – classification and their biological functions – dietary elements (Na, K, Ca, P, Mg, S, Fe, Zn, Se, Mo)

UNIT II: Drugs (12 Hours)

Drugs – classification of drugs – drugs acting on CNS – general anaesthetics, hypnotics & sedatives, narcotics, antipyretics, antirheumatics, analgesics, anticonvulsants and antitussives – chemotherapeutic drugs – antibiotics, antiseptics and disinfectants – cardiovascular agents – anti cancer drugs – adverse effects of drugs.

UNIT III: Body Fluids (12 Hours)

composition of blood- blood volume, blood groups, functions of blood, blood pressure, anaemia, blood sugar - respiration – oxygen and carbon dioxide transport in blood – haemoglobin –myoglobin - composition of urine – electrolyte balance – Na/K pump

UNIT IV: Enzymes and Hormones (12 Hours)

Enzymes – types and their roles in biochemical reactions – hormones – types and functions – digestion in mouth, stomach, intestine and pancreas

UNIT V: Common and Vitamin Deficiency Diseases (12 Hours)

Jaundice, cancer, kidney stone - typhoid, dengue, ulcer, goiter, diabetes, rickets, scurvy, beriberi, pellagra, night blindness, Covid-19 – causes – symptoms - diagnosis – vaccines/treatment

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	MCQ, seminar, assignment, snap test

Books for Study:

1. Ramani A V, (2009), Food *Chemistry*, MJP Publishers.
   Unit I *Chapter 1, 2, 3 and 5*
   Unit III *Chapter 1*
   Unit IV *Chapter 1*
2. Ghosh, J A, (1999), *Text book of Pharmaceutical Chemistry*, S. Chand and Co. Ltd.
   Unit II *Chapter 1*
   Unit V *Chapter 1*

Books for Reference:

1. Ashutosh Kar, (1993), *Medicinal Chemistry*, Wiley Easterns Limited.
2. Deb A C, (1994), *Fundamentals of Biochemistry*, New Central Book Agency.
3. Parul R. Sheth, (2000), *Chemicals of Life*, National Institute of Science Communication (CSIR).
4. Satake M and Mido Y, (2003), *Chemistry for Health Science*, Discovery Publishing House.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Understand the global malnutritional problems	**K1**
CO2	Describe the functions of drugs and their mode of action	**K2**
CO3	Analyze the composition of blood and their functions	**K3**
CO4	Demonstrate the biological functions of enzymes and hormones	**K4**
CO5	Discuss the causes of various diseases and their treatment	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UCH63ES03B**			**Discipline Specific Elective – 3:** Health Science						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	3	1	2	3	2	3	1	**2.3**
CO2	3	3	1	2	2	3	3	2	2	2	**2.3**
CO3	2	3	2	2	2	3	2	2	2	2	**2.2**
CO4	2	2	2	2	2	2	2	2	3	2	**2.1**
CO5	3	2	2	1	2	3	2	2	3	2	**2.2**
Mean Overall Score											**2.22 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH 63ES04A	**Discipline Specific Elective – 4:** Current Trends in Chemistry - 1	4	3

Course Objectives
To utilize chromatographic methods to assess the extent of pollution in various environmental segments.
To explain and interpret the functioning of living systems and pursue higher studies or research in related fields.
To comprehend the core principles of solid-state chemistry, including crystal structures, symmetry, lattice frameworks, X-ray diffraction methods, and atomic arrangement analysis.
To study molecular polarization, dipole moments, polymerization, and the properties of polymers.
To explore the fundamentals of nanoscience and nanotechnology, including nanoparticle chemistry, synthesis methods, characterization techniques, and applications of nanomaterials.

Unit I: Column and Thin–layer Chromatography (12 Hours)

Introduction – Types of liquid chromatography – Equipment for HPLC –Derivatization – Quantitative analysis – Thin–layer chromatography – High performance thin–layer chromatography (HPTLC) – Separation of aspirin, phenacetin and caffeine in a mixture – Thin–layer chromatography – The recovery of separated substances by elution techniques.

Unit II: Gas Chromatography (12 Hours)

Introduction –apparatus –programmed–temperature gas chromatography – quantitative analysis byGLC – elemental analysis using gas chromatography – determination of aluminium by gas chromatographic analysis of its tris(acetylacetonato) complex – analysis of a mixture using the internal normalization method – determination of sucrose as its trimethylsilyl derivative using GLC.

UNIT III: Solid State (12Hours)

Forms of solids -isotropic and anisotropic solids - interfacial angle - symmetry elements in crystal systems - Bravais lattices - unit cell - law of rational indices (Weiss indices), Miller indices - unit cell dimension - density - number of atoms per unit cell - X-ray diffraction by crystals - derivation of Bragg's equation - experimental methods of X-ray study- rotating crystal method - X-ray pattern by powder method - determination of Avogadro number - vitreous state.

UNIT IV: Polymerisation (12 Hours)

Polymers- Nomenclature -Functionality -Classification - types of polymerizations methods - Addition polymerization – Condensation polymerization –copolymerization- Mechanism of Addition Polymerization- Cationic and Anionic polymerization - Free radical and Co-ordination or Ziegler-Natta polymerization. Thermoplastics and thermos settings- General properties of polymers - molecular weight- viscosity- mechanical property - molecular weight relationships - number average and weight average molecular weight.

UNIT V: Nano Chemistry (12 Hours)

Basics of nanoscience and nanotechnology – Chemistry of nanoparticles – Nanotechnology – Methods of synthesis of nanomaterials (sol-gel, co-precipitation, and plasma arching methods) – SEM and TEM – Fullerene – Carbon nanotubes: types and synthesis – Catenanes and rotaxanes: preparation and properties – Applications of nanomaterials.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Jeffery, G. H., Bassett, J., Mendham, J., and Denney, R. C. (1989). *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.). Longman Scientific and Technical.
2. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry* (9th Ed.). Brooks/Cole Cengage Learning.
3. Laidler, K. J., & Meiser, J. H. (2006). *Physical Chemistry* (2nd Ed.). CBS Publishers & Distributors.
4. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). Principles of Physical Chemistry (49th Ed.).

Shoban Lal Nagin Chand & Co.
5. Gowariker, V. R., Viswanathan, N. V., & Sreedhar, J. (2021). *Polymer Science* (4th Ed.). New Age International (P) Ltd.
6. Murty, B. S., Shankar, P., Baldev Raj, Rath, B. B., & Murday, J. (2012). *Textbook of Nanoscience and Nanotechnology*. Universities Press.

Books for Reference:

1. O'Rourke, J. V. (2009). *Thin Layer Chromatography: A Modern Practical Approach,* (1stEd.). Springer.
2. McNair, H. M., & Miller, J. M. (2009). *Basic Gas Chromatography,* (2ndEd.). Wiley-Interscience.
3. Schoenmakers, P. J., & Vander Kloet, J. H. P. V. (1998). *Gas Chromatography,* (1stEd.). Elsevier Science.
4. Levelt Sengers, J. M., & de Haas, H. W. M. (1981). *Gas Chromatography: Principles and Applications,* (1st Ed.). Springer.
5. Gunter, L. M. M. R. (2005). *Column Chromatography: Methods and Applications,* (1stEd.). Springer.
6. Billmeyer, F. W. (1994). *Textbook of Polymer Science,* (3rdEd.). John Wiley.
7. Atkins, P.W., & Paula, J. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=ltT8vr5Wmz8
2. https://www.youtube.com/watch?v=example_lin
3. https://galileoandeinstein.phys.virginia.edu/Elec_Mag/2022_Lectures/EM_29_Molecular_Polarizability.html?utm_source=chatgpt.com

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Use the chromatographic methods to test extent to which the various segments of the current environment are polluted.	**K1**
CO2	Explain and interpret the functioning of living systems and may pursue higher studies/research in related subjects.	**K2**
CO3	Gain a deep understanding of solid-state chemistry, including crystal structures, symmetry, lattice properties, X-ray diffraction techniques, and atomic arrangement analysis.	**K3**
CO4	Gain advanced knowledge of polarization, polymerization, and polymer properties.	**K4**
CO5	Acquire knowledge of nanomaterial synthesis, characterization, properties, and their applications in various fields.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
6	**25UCH63ES04A**			**Discipline Specific Elective – 4:** Current Trends in Chemistry - 1					**4**	**3**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	2	3	2	2	2	**2.2**
CO2	2	3	1	3	2	2	3	1	3	2	**2.2**
CO3	3	2	1	2	2	3	2	1	2	2	**2.0**
CO4	3	2	2	2	3	3	2	2	2	3	**2.4**
CO5	2	2	2	2	2	2	2	2	2	2	**2.0**
										Mean Overall Score	**2.16 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63ES04B	**Discipline Specific Elective – 4:** Current Trends in Chemistry - 2	4	3

Course Objectives
To utilize spectrophotometric techniques to assess pollution levels in various environmental segments.
To understand the functioning of living systems and pursue higher studies or research in related fields.
To comprehend the core principles of solid-state chemistry, including crystal structures, symmetry, lattice frameworks, X-ray diffraction methods, and atomic arrangement analysis.
To explore the fundamentals of statistical thermodynamics, covering probability, states, phase space, and entropy.
To examine the electrochemical principles of metal deposition, passivity, corrosion mechanisms, and advanced corrosion prevention techniques.

UNIT I: Gravimetric and Thermogravimetric Methods (12 Hours)

Gravimetric analysis: Mechanism of precipitation – solubility products – common ion effect – Types of precipitation – co–precipitation and post precipitation – homogeneous precipitation.

Thermal Analysis: Principle, Instrumentation and applications of TGA, DTA and DSC.

UNIT II: Colorimetry, Spectrophotometry and Spectrofluorimetry (12 Hours)

General discussion – theory of spectrophotometry and colourimetry. Classification of methods of 'colour' measurement or comparison – standard series method – balancing method – photoelectric photometer method – wavelength selection – radiation sources – cells – data presentation – layout of instruments – derivative spectrophotometry – the origins of absorption spectra. spectrofluorimetry– general discussion – instruments for fluorimetric analysis – some applications of fluorimetry.

UNIT III: Solid State (12 Hours)

Forms of solids -isotropic and anisotropic solids - interfacial angle - symmetry elements in crystal systems - Bravais lattices - unit cell - law of rational indices (Weiss indices), Miller indices - unit cell dimension - density - number of atoms per unit cell - X-ray diffraction by crystals - derivation of Bragg's equation - experimental methods of X-ray study- rotating crystal method - X-ray pattern by powder method - determination of Avogadro number - vitreous state.

UNIT IV: Statistical Thermodynamics (12 Hours)

Permutation and Permutation and combination - combinatory rule - probability theorems - micro and macrostates -phase space - thermodynamic probability - statistical equilibrium - Maxwell - Boltzmann statistics and its derivation - relation between entropy and probability.

UNIT V: Corrosion of Metals (12 Hours)

Physical nature of electrodeposited metals-simultaneous discharge of cations- depolarization of metal deposition- separation of metals by electrolysis- electrochemical passivity- theories of passivity mechanical passivity - corrosion of metals: mechanism-hydrogen evolution type- corrosion in presence of a depolarizer- differential oxygenation corrosion- electrolytic reduction and oxidation- reversible oxidation-reduction processes- non-reversible processes- electrolytic reduction and oxidation- methods for preventing corrosion- cathodic and anodic protection- anodic and cathodic inhibitors.

Teaching Methodology	Chart, PPT, chalk and talk and videos.
Assessment Methods	Snap Test, Seminar, group discussion and MCQ

Books for Study:

1. Jeffery, G. H., Bassett, J., Mendham, J., and Denney, R. C. (1989). *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.). Longman Scientific and Technical.
   Unit - I *Chapter 11*
   Unit - II *Chapters 17 and 18*
2. Puri, B. R., Sharma, L. R., & Pathania M.S (2024). *Principles of Physical Chemistry* (49th Ed.). Shoban Lal Nagin Chand & Co.
   Unit- III, IV

3. Murty, B. S., Shankar, P., Baldev Raj, Rath, B. B. & James Murday. (2012). *Textbook of Nanoscience and Nanotechnology,* Universities Press.

Unit- V

Books for Reference:

1. Gopalan, K. K. (2006). *Principles of Colorimetry,* (1st Ed.). New Age International Publishers.
2. Hunter, R. S. (1972). *Gravimetric Analysis,* (1st Ed.). Prentice Hall, New Jersey.
3. Hough, M. A. H. (1988). *Thermogravimetric Analysis,* (1st Ed.). Springer.
4. Dyer, J. R. (1995). *Applications of Absorption Spectrophotometry of Organic Compounds,* (1st Ed.). Prentice-Hall, New Jersey.
5. West, A. R. (2014). *Solid state Chemistry and its applications*, (2ndEd.). John Wiley &Sons Ltd.
6. Smart, L.; Moore. E. (2012). *Solid State Chemistry – An Introduction*, (4th Ed.). CRC Press.
7. Atkins, P.W., & Paula, J. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.
8. Castellan, G. W. (2004). *Physical Chemistry* (4thEd.). Narosa.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=Y1s83TqYTRg
2. https://www.youtube.com/watch?v=PJscrFMtYE0

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Use the spectrophotometric techniques to test the pollution level of various segments of the current environment.	**K1**
CO2	Explain the functioning of living systems and may pursue higher studies/research in related subjects.	**K2**
CO3	Gain a deep understanding of solid-state chemistry, including crystal structures, symmetry, lattice properties, X-ray diffraction techniques, and atomic arrangement	**K3**
CO4	Understand the basics of statistical thermodynamics	**K4**
CO5	Attain a profound understanding of metal corrosion dynamics, electrochemical passivity, and innovative strategies for corrosion control and prevention.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
6	**25UCH63ES04B**			**Discipline Specific Elective – 4:** Current Trends in Chemistry - 2					**4**	**3**	
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	2	3	2	2	2	**2.2**
CO2	2	3	1	3	2	2	3	1	3	2	**2.2**
CO3	3	2	1	2	2	3	2	1	2	2	**2.0**
CO4	3	2	2	2	3	3	2	2	2	3	**2.4**
CO5	2	2	2	2	2	2	2	2	2	2	**2.0**
										Mean Overall Score	**2.16 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH63CE01	Comprehensive Examination	-	2

Course Objectives
To evaluate candidate's understanding of basic concepts, principles and theories in various branches of chemistry
To solve complex problems related to different areas of chemistry including inorganic, organic and physical chemistry.
To evaluate the capacity for critical thinking, logical reasoning and analytical skills in the context of chemical problems.
To encourage an integrated understanding of chemistry, encompassing inorganic, organic and physical chemistry aspect.
To encourage innovative thinking and creativity in approaching and solving chemical problems

UNIT I: Concepts in Inorganic Chemistry

Lewis structures, the octet rule, resonance, the VSEPR model, shapes of molecules, modifications of the basic shapes, valence bond theory, hydrogen molecule, polyatomic molecules, electron promotion, hypervalence, hybridization, molecular orbital theory, approximations of the theory, bonding and antibonding orbitals, homonuclear diatomic molecules, the orbitals, the building-up principle for molecules, heteronuclear diatomic molecules, heteronuclear molecular orbitals, hydrogen fluoride, carbon monoxide, bond properties, bond order, bond correlations, polyatomic molecules, polyatomic molecular orbitals, hypervalence in the context of molecular orbitals, localization, localized bonds and hybridization, electron deficiency, molecular shape in terms of molecular orbitals, structure and bond properties, bond length, bond strength, electronegativity and bond enthalpy, oxidation states. *Nuclear Chemistry:* Isotopes, isobars and isotones – determination of nuclear masses by J J Thomson's method– theory of radioactivity – radioactive series – radioactive isotopes – mass defect– binding energy– fusion and fission reactions – plutonium and hydrogen bombs – applications of radioactivity

UNIT II: Concepts in Physical Chemistry

Chemical equilibrium: Gibbs energy and the helmholtz energy, differential forms of u, h, a, and g, dependance of Gibbs energy and the helmholtz energy on p, v, and t, gibbs energy of a reaction mixture, gibbs energy of a gas in a mixture, calculating the gibbs energy of mixing for ideal gases, calculating δg_r for a chemical reaction, equilibrium constants for mixture of ideal gases. calculating the equilibrium partial pressures in a mixture of ideal gases, variation of kp with temperature. *Chemical Kinetics:* Zero, first, second and third order reactions with examples–molecularity– derivation of rate law and half–life period. *Electrochemistry:* Cell, half-cell, Typesof Cell, Electrodes, Electrolytes, Nernst equation, Electrochemical series, electroplating, applications *Solid state*: Crystalline and amorphous solids, unit cell, cell parameters, Bravais lattice, crystal defects and its types

UNIT III: Basic Concepts in Organic Chemistry and Stereochemistry

Electronic effects: resonance, inductive, hyperconjugation, steric effects and its applications for various topics on acid or base property; optical isomerism in compounds with and without any stereocenters such as allenes, biphenyls, etc; the conformation of acyclic systems includes substituted ethane or n-propane or n-butane as well as cyclic systems containing mono- and di-substituted cyclohexanes, etc.

UNIT IV: Organic Reaction Mechanism and Spectroscopy

Elimination – addition reactions – electrophilic and nucleophilic substitution – aliphatic, aromatic and at carbonyl carbons – pericyclic reactions – stereochemistry of reaction mechanism – chemoselectivity – regio and stereoselectivity of organic reactions – reactions at allylic carbons – beta and alpha alkylations. *Organic Reaction Mechanism and Synthetic Applications:* Chemistry of reactive intermediates covering carbocations, carbanions, free radicals, carbenes, nitrenes along with benzynes, etc.; HofmannCurtius-Lossen rearrangement, Wolff rearrangement, Simmons-Smith reaction. It also covers Reimer-Tiemann reaction, Michael reaction, Darzens reaction, Wittig reaction, and McMurry reaction; Pinacolpinacolone, Favorskii, benzilic acid rearrangement, dienone-phenol rearrangement, Baeyer - Villeger reaction, Qualitative Organic Analysis: UV, IR and 1H NMR spectroscopic techniques as tools for structural elucidation.

UNIT V Problems Solving in Chemistry

IIT JAM questions and solutions from 2015-2025.

Teaching Methodology	Self Study
Evaluation Methodology	MCQ, Test

Books for Study:

1. Atkins, P., Shriver, D., Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2014). *Inorganic Chemistry* (5th Ed.). W. H. Freeman and Company, New York, USA.
2. Engel, T., & Reid, P. (2013). *Physical Chemistry* (3rd Ed.). Pearson Education Inc., New Delhi, India.
3. Atkins, P., & de Paula, J. (2006). *Physical Chemistry* (8th Ed.). Oxford University Press, New Delhi, India.
4. Bruice, P. Y. (2011). *Organic Chemistry* (8th Ed.). Pearson Ltd., USA.

Books for Reference:

1. Huheey, J. E., Keiter, E. A., Keiter, R. L., & Medhi, O. K. (1993). *Inorganic Chemistry – Principles of Structure and Reactivity* (4th Ed.). Pearson, New Delhi, India.
2. March, J. (1992). *Advanced Organic Chemistry* – Reactions, Mechanisms, and Structure (4th Ed.). John Wiley & Sons, New York, USA.
3. Lee, J. D. (2006). *Concise Inorganic Chemistry*. Blackwell Science, UK.
4. Morrison, R. T., Boyd, R. N., & Bhattacharjee, S. K. (2009). *Organic Chemistry* (7th Ed.). Pearson, New York, USA.
5. Puri, B. P., & Sharma, L. R. (2018). *Principles of Physical Chemistry* (47th Ed.). Vishal Publication, New Delhi, India.

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc22_cy02/preview
2. https://archive.nptel.ac.in/courses/104/106/104106119/
3. https://archive.nptel.ac.in/courses/104/106/104106089/
4. https://jam.iitr.ac.in/previous-year-question-papers.html

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Study and understand the atomic structure of inorganic compounds.	**K1**
CO2	Identify the key principles in organic chemistry	**K2**
CO3	Predict the products and intermediates in common organic rearrangements reaction	**K3**
CO4	Evaluate the rate equations to quantitatively analyze reaction kinetics	**K4**
CO5	Develop the problem-solving skills	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UCH63CE01**			Comprehensive Examination						**-**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	2	2	1	1	3	**2.0**
CO2	2	1	1	2	3	3	3	3	2	1	**2.1**
CO3	2	3	3	1	1	1	3	3	3	3	**2.1**
CO4	2	3	2	2	2	3	3	3	1	1	**2.1**
CO5	3	3	3	2	2	3	3	2	1	3	**2.3**
										Mean Overall Score	**2.12 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UCH64OE02	**Open Elective – 2:** Food and Nutrition	4	2

Course Objectives
To learn the classification and composition of food
To understand the dietary requirements and sources
To learn the food conversion operations
To understand the testing methods of all food adulterants
To learn the Principal adulterants and their health effects

UNIT I: Introduction to Food Chemistry (12 Hours)

Definition of food - classification and composition of food – world food requirement – food safety for the consumer - nutrition – malnutrition – basic chemical constituents of food – carbohydrates, proteins, vitamins and minerals - food as the nutritional supplements - food borne diseases – Indian standards for food quality.

UNIT II: Biological functions of Water and Vitamins (12 Hours)

Introduction to water - Role and functions of water in biological systems – dietary requirements and sources – physical properties of water – solute–water interactions – Introduction to vitamins – classification – water soluble and fat soluble vitamins – Role and functions of vitamins in biological systems.

UNIT III: Food Conversion Operations (12Hours)

Food conversion operations - Size Reduction – screening – mixing – emulsification – filtration – centrifugation – extraction – crystallization-Need for food conversion.

UNIT IV: Testing of Food Adulteration (12 Hours)

Introduction to adulterants – Common adulterants in food – testing methods of all food adulterants– natural food pigments – introduction and classification.

UNIT V: Health Problems of Food Adulteration (12 Hours)

Principal adulterants and their health effects – diarrhea, fever, cancer, liver and kidney diseases – new product development **–** definition– importance – need of product development – steps of product development.

Teaching Methodology	Videos, PPT, demonstration, group discussion, chalk and talk, blended learning
Assessment Methods	Multiple choice questions, Open book test, assignment, seminar, snap test

Books for Study:

1. Aurand L W and Wood A E (1973., *Food Chemistry*. The AVI Publishing Co., Connecticut,
   Unit– I *Chapter 1 and 2*
   Unit– II *Chapter 7*
2. Belitz H D, Grosch W and Schieberler P (2004), *Food Chemistry*. Springer, Berlin,
   Unit– III *Chapter 13*
   Unit– IV *Chapter 9*
3. DeMan, J M, (1999). *Principles of Food Chemistry*, A Chapman and Hall Food Science Book, Aspen Publ., Inc., Gaithersburg, Maryland,.
   Unit– I *Chapter 6.3, 6.4 ,6.5 and 6.6*

Books for Reference:

1. Alex Ramani, V., (2009), *Food Chemistry*, MJP Publishers, Triplicane, Chennai,
2. Fennama, O. R., (1996) *Food Chemistry*, Marcel Dekker, Inc., New York,
3. Gopalan, C., Rama Sastri, B. V., and Balasubramaniam S C, (1989) *Nutritive Value of Indian Foods*, National Institute of Nutrition, ICMR, Hyderabad,
4. Meyer, L. H., (1976), *Food Chemistry*, Reinhold Publications, Corporation, New York.

Websites and eLearning Sources:

1. https://nzifst.org.nz/resources/unitoperations/introduction2.htm
2. https://testing–lab.com/food–testing/food–adulterants/

3. https://www.youtube.com/watch?v=GlD2sExkepw

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Improve the health standard of humankind by eliminating harmful effects of food adulterants.	**K1**
CO2	Understand the composition of food.	**K2**
CO3	Acquire the knowledge of biological functions of water.	**K3**
CO4	Apply the food conversion operations in the contemporary life.	**K4**
CO5	Analyze and identify the common adulterants present in various food stuffs.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UCH64OE02**			**Open Elective – 2:** Food and Nutrition						**4**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	2	1	2	2	3	2	1	2.0
CO2	2	2	3	2	2	3	2	2	3	2	2.3
CO3	2	2	1	3	2	2	1	2	3	2	2.0
CO4	3	2	2	3	2	2	3	2	2	3	2.4
CO5	2	1	2	3	2	3	3	2	1	2	2.1
Mean Overall Score											**2.16 (Medium)**