

B Sc CHEMISTRY

LOCF SYLLABUS 2023



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) POSTGRADUATE 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 TANSCHÉ 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 133 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.

Foundation Course (FC): Foundation Courses serve to bridge the gap in knowledge and skills between secondary education and college-level studies, facilitating a smoother transition for students entering higher education.

Skill Enhancement Course (SE): 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 (AE): 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 courses 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 (ES): 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 ES, a minimum of two courses of equal importance/weightage is a must. A department with two sections must offer two courses to the students.

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

Self-paced Learning (SP): It is a two-credit course designed to foster students' ability for independent and self-directed learning. With a syllabus structured to be completed within 45 hours, this course encourages learners to take control of their own educational journey. Notably, Self-paced Learning is conducted outside of regular class hours, emphasizing autonomy and self-motivation in students.

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.

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:

23	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

FC - Foundation Course

SE - 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

SP - Self-paced Learning

EG - Generic Elective

ES - Discipline Specific Elective

PW - Project and Viva Voce

CE - Comprehensive Examination

OR - Outreach Programme

EVALUATION PATTERN

Continuous Internal Assessment

Sl No	Component	Marks Alloted
1	Mid Semester Test	30
2	End Semester Test	30
3	*Three Components (15 + 10 + 10)	35
4	Library Referencing (30 hours)	5
Total		100

Passing minimum: 40 marks

* The first component is a compulsory online test (JosTEL platform) comprising 15 multiple choice questions (10 questions at K1 level and 5 questions at K2 level); The second and the third components are decided by the course in-charge.

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						$7 \times 1 = 7$
B (compulsory)			5					$5 \times 3 = 15$
C (either...or type)				3				$3 \times 6 = 18$
D (2 out of 3)	For courses with K5 as the highest cognitive level, one K4 and one K5 question is compulsory. (Note: two questions on K4 and one question on K5)				1	1*		$2 \times 10 = 20$
	For courses with K6 as the highest cognitive level: Mid Sem: two questions on K4 and one question on K5; End Sem: two questions on K5 and one question on K6)				Mid Sem			
						End Sem		
				1	1	1*		
Total								60

* Compulsory

Question Paper Blueprint for Semester Examination

Duration: 3 Hours		Maximum Marks: 100				
UNIT	Section A (Compulsory)	Section B (Compulsory)	Section C (Either...or type)	Section D (3 out of 5)		
	K1	K2	K3	K4	K5	
UNIT I	2	2	2	3*	2*	
UNIT II	2	2	2			
UNIT III	2	2	2			
UNIT IV	2	2	2			
UNIT V	2	2	2			
Marks	$10 \times 1 = 10$	$10 \times 3 = 30$	$5 \times 6 = 30$	$3 \times 10 = 30$		

* For courses with K5 as the highest cognitive level wherein two K4 and one K5 questions are compulsory. (Note: three questions on K4 and two question on K5)

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

Title of the Course	CIA	Semester Examination	Total Marks
<ul style="list-style-type: none">• Skill Enhancement Course (Non Major Elective)• Foundation Course• Skill Enhancement Course (WS)	20 + 10 + 20 = 50	50 (A member from the Department other than the course instructors)	100
<ul style="list-style-type: none">• Self-paced Learning• Comprehensive Examination	25 + 25 = 50	50 (CoE)	100
<ul style="list-style-type: none">• Value Education• Environmental Studies	50	50 (CoE)	100
<ul style="list-style-type: none">• Skill Enhancement Course: Soft Skills	100	-	100
<ul style="list-style-type: none">• Generic Elective	100	100 (CoE)	100
<ul style="list-style-type: none">• Project Work and Viva Voce	100	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:

$$SGPA \text{ and } CGPA = \frac{\sum_{i=1}^n C_i G_{pi}}{\sum_{i=1}^n C_i}$$

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

Where,

C_i - credit earned for the Course i

G_{pi} - Grade Point obtained for the Course i

M_i - 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 imbued with ethical values and social concern will be able to understand and appreciate social harmony, cultural diversity ensure sustainable environment.

Programme Specific Objectives (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.

PROGRAMME STRUCTURE					
Part	Semester	Specification	No. of Courses	Hours	Credits
1	1 - 4	Languages (Tamil / Hindi/ French/ Sanskrit)	4	17	12
2	1 - 4	General English	4	20	12
3	1 - 6	Core Course	8	42	33
	1 - 6	Core Practical	6	31	21
	1, 2	Allied Course	2	12	8
	3, 4	Allied Optional	2	8	6
	3, 4	Allied Optional Practical	1	4	2
	5, 6	Discipline Specific Elective	4	20	12
	5	Internship	1	-	1
	5	Self-paced Learning	1	-	2
	5	Project Work and Viva Voce	1	-	2
	5	Comprehensive Examination	1	-	2
4	1	Foundation Course	1	2	1
	1	Skill Enhancement Course (Non-Major Elective)	1	2	1
	5	Skill Enhancement Course (Soft Skills)	1	2	1
	6	Skill Enhancement Course (WS)	1	2	1
	1 - 4	Value Education	4	8	4
	1, 2	Ability Enhancement Compulsory Course	2	2(6)	4
	5, 6	Generic Elective	2	8	4
5	2 - 6	Outreach Programme (SHEPHERD)	-	-	4
	2 - 6	Extra Credit Courses (MOOC)/Certificate Courses	(5)	-	(15)
		Total	47(5)	180(6)	133(15)

PROGRAMME PATTERN								
Course Details						Scheme of Exams		
Sem	Part	Course Code	Title of the Course	Hours	Credits	CIA	SE	Final
1	1	23UTA11GL01A	General Tamil - 1	5	3	100	100	100
		23UFR11GL01	French - 1					
		23UHI11GL01	Hindi - 1					
		23USA11GL01	Sanskrit - 1					
	2	23UEN12GE01	General English - 1	5	3	100	100	100
	3	23UCH13CC01	Core Course - 1: General Chemistry - 1	5	3	100	100	100
		23UCH13CP01	Core Practical - 1: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	3	3	100	100	100
		23UCH13AC01	Allied Course - 1: Mathematics for Chemistry - 1	6	4	100	100	100
	4	23UCH14FC01	Foundation Course: Fundamentals of Chemistry	2	1	100	-	100
		-	Skill Enhancement Course - 1: (Non Major Elective): Refer ANNEXURE 1	2	1	100	-	100
		23UHE14VE01	Value Education - 1: Essentials of Humanity*	2	1	50	50	50
23UEN14AE01		Ability Enhancement Compulsory Course - 1: Communicative English	(6)	3	100	-	100	
Total				30	22			
2	1	23UTA21GL02	General Tamil - 2	4	3	100	100	100
		23UFR21GL02	French - 2					
		23UHI21GL02	Hindi - 2					
		23USA21GL02	Sanskrit - 2					
	2	23UEN22GE02	General English - 2	5	3	100	100	100
	3	23UCH23CC02	Core Course - 2: General Chemistry - 2	5	4	100	100	100
		23UCH23CP02	Core Practical - 2: Qualitative Analysis	6	4	100	100	100
		23UCH23AC02	Allied Course - 2: Mathematics for Chemistry- 2	6	4	100	100	100
	4	23UHE24VE02	Value Education - 2: Fundamentals of Human Rights*	2	1	50	50	50
		23UHE24AE01	Ability Enhancement Compulsory Course - 2: Environmental Studies*	2	1	50	50	50
		-	Extra Credit courses (MOOC / Certificate courses) - 1	-	(3)			
Total				30	20(3)			
3	1	23UTA31GL03	General Tamil - 3	4	3	100	100	100
		23UFR31GL03	French - 3					
		23UHI31GL03	Hindi - 3					
		23USA31GL03	Sanskrit - 3					
	2	23UEN32GE03	General English - 3	5	3	100	100	100
	3	23UCH33CC03	Core Course - 3: General Chemistry - 3	5	4	100	100	100
		23UCH33CC04	Core Course - 4: General Chemistry - 4	5	4	100	100	100
		23UCH33CP03	Core Practical - 3: Physical Chemistry - 1	3	2	100	100	100
		23UCH33AO01A	Allied Optional - 1: Physics - 1	4	3	100	100	100
		23UCH33AO01B	Allied Optional - 1: Principles of Electronics					
		@	Allied Optional Practical- 1: Physics	2	-	-	-	-
		@	Allied Optional Practical - 1: Electronics	2	-	-	-	-
	4	23UHE34VE03A	Value Education - 3: Social Ethics - 1*	2	1	50	50	50
		23UHE34VE03B	Value Education - 3: Religious Doctrine-1*					
	-	Extra Credit courses (MOOC / Certificate courses) - 2	-	(3)				
Total				30	20(3)			

4	1	23UTA41GL04B	General Tamil - 4: அறிவியல் தமிழ் (Scientific Tamil)	4	3	100	100	100
		23UFR41GL04	French - 4					
		23UHI41GL04	Hindi - 4					
		23USA41GL04	Sanskrit - 4					
	2	23UEN42GE04	General English - 4	5	3	100	100	100
	3	23UCH43CC05	Core Course - 5: General Chemistry - 5	5	4	100	100	100
		23UCH43CC06	Core Course - 6: General Chemistry - 6	5	4	100	100	100
		23UCH43CP04	Core Practical - 4: Physical Chemistry - 2	3	2	100	100	100
		23UCH43AO02A	Allied Optional - 2: Physics - 2	4	3	100	100	100
		23UCH43AO02B	Allied Optional - 2: Communication Electronics					
		23UCH43OP01A	Allied Optional Practical: Physics	2	2	100	100	100
	23UCH43OP01B	Allied Optional Practical: Electronics						
	4	23UHE44VE04A	Value Education - 4: Social Ethics - 2*	2	1	50	50	50
		23UHE44VE04B	Value Education - 4: Religious Doctrine - 2*					
	-	Extra Credit courses (MOOC / Certificate courses) - 3		(3)				
Total			30	22(3)				
5	3	23UCH53CC07	Core Course - 7: Organic Chemistry - 1	6	5	100	100	100
		23UCH53CP05	Core Practical - 5: Organic Qualitative Analysis and Determination of Physical Constants	8	5	100	100	100
		23UCH53ES01A	Discipline Specific Elective-1: Inorganic Chemistry-1	5	3	100	100	100
		23UCH53ES01B	Discipline Specific Elective - 1: Inorganic Chemistry - 2					
		23UCH53ES02A	Discipline Specific Elective - 2: Physical Chemistry - 1	5	3	100	100	100
		23UCH53ES02B	Discipline Specific Elective - 2: Physical Chemistry - 2					
		23UCH53IS01	Internship	-	1	100	-	100
	23UCH53SP01	Self-paced Learning: Essentials of Chemistry*	-	2	50	50	50	
	4	-	Generic Elective - 1: Refer ANNEXURE 2	4	2	100	100	100
		23USS54SE01	Skill Enhancement Course - 2: Soft Skills	2	1	100	-	100
	-	Extra Credit courses (MOOC / Certificate courses) - 4		(3)				
Total			30	22(3)				
6	3	23UCH63CC08	Core Course - 8: Organic Chemistry - 2	6	5	100	100	100
		23UCH63CP06	Core Practical - 6: Gravimetric Analysis and Organic Preparation	8	5	100	100	100
		23UCH63ES03A	Discipline Specific Elective - 3: Inorganic Chemistry - 3	5	3	100	100	100
		23UCH63ES03B	Discipline Specific Elective - 3: Inorganic Chemistry - 4					
		23UCH63ES04A	Discipline Specific Elective - 4: Physical Chemistry - 3	5	3	100	100	100
		23UCH63ES04B	Discipline Specific Elective - 4: Physical Chemistry - 4					
		23UCH63PW01	Project Work and Viva Voce	-	2	100	100	100
		23UCH63CE01	Comprehensive Examination*	-	2	50	50	50
	4	-	Generic Elective - 2: Refer ANNEXURE 3	4	2	100	100	100
		-	Skill Enhancement Course - 3 (WS): Refer ANNEXURE 4	2	1	100	-	100
		-	Extra Credit courses (MOOC / Certificate courses) - 5		(3)			
Total			30	23(3)				
2 - 6	5	23UCW65OR01	Outreach Programme (SHEPHERD)	-	4			
1 - 6	Total (3 years)			180	133(15)			

*- for grade calculation 50 marks are converted into 100 in the mark statements

Passed by	Board of Studies Meeting held on 18.12.2023
Approved by	48th Academic Council Meeting held on 27.03.2024

ANNEXURE 1**Skill Enhancement Course - 1: (Non-Major Elective)***

Department	Course Code	Title of the Course
Botany	23UBO14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Organic Farming
Computer Science	23UCS14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Office Automation
BCA	23UBC14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Fundamentals of Information Technology
Mathematics	23UMA14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Mathematics for Competitive Examinations
Statistics	23UST14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Basics of Statistics
Vis Com	23UVC14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Digital Storytelling and Scriptwriting
English	23UEN14SE01	Skill Enhancement Course - 1: (Non-Major Elective): English for Communication
History	23UHS14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Introduction to Tourism
Tamil	23UTA14SE01	Skill Enhancement Course - 1: (Non-Major Elective): பேச்சுக்கலைத் திறன் (Oratory Skills)
BBA	23UBU14SE01A	Skill Enhancement Course - 1: (Non-Major Elective): Practical Advertising
	23UBU14SE01B	Skill Enhancement Course - 1: (Non-Major Elective): Digital Marketing
B. Com	23UCO14SE01A	Skill Enhancement Course - 1: (Non-Major Elective): Introduction to Accounting
	23UCO14SE01B	Skill Enhancement Course - 1: (Non-Major Elective): Consumer Protection and Rights
B. Com CA	23UCC14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Entrepreneurship Skills
Economics	23UEC14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Demography
Electronics	23UEL14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Consumer Electronics
Physics	23UPH14SE01A	Skill Enhancement Course - 1: (Non-Major Elective): Physics for Everyday Life
	23UPH14SE01B	Skill Enhancement Course - 1: (Non-Major Elective): Home Electrical Installation

*Offered to students from other Departments

ANNEXURE 2
Generic Elective - 1*

Department	Course Code	Title of the Course
Botany	23UBO54EG01	Generic Elective - 1: Landscape designing
Computer Science	23UCS54EG01	Generic Elective - 1: Ethical Hacking
BCA	23UBC54EG01	Generic Elective - 1: Fundamentals of Data Science
Mathematics	23UMA54EG01	Generic Elective - 1: Numerical Ability
Statistics	23UST54EG01	Generic Elective - 1: Actuarial Statistics
Vis Com	23UVC54EG01	Generic Elective - 1: Media Education
English	23UEN54EG01	Generic Elective - 1: Film Studies
History	23UHS54EG01	Generic Elective-1: Tamil Heritage and Culture
Tamil	23UTA54EG01	Generic Elective - 1: தமிழிலக்கியத்தில் மனித உரிமைகள் (Human rights in Tamil literature)
BBA	23UBU54EG01A	Generic Elective - 1: Global Supply Chain Management
	23UBU54EG01B	Generic Elective - 1: Starts-ups and small Business Management
B.Com.	23UCO54EG01A	Generic Elective - 1: Computerised Accounting
	23UCO54EG01B	Generic Elective - 1: Basics of Excel
	23UCO54EG01C	Generic Elective - 1: Personal Investment Planning
B. Com CA	23UCC54EG01	Generic Elective - 1: E-commerce and E Business Management
Economics	23UEC54EG01	Generic Elective - 1: Principles of Economics
Electronics	23UEL54EG01A	Generic Elective - 1: Everyday Electronics
	23UEL54EG01B	Generic Elective - 1: Wireless Communication
Physics	23UPH54EG01A	Generic Elective-1: Everyday Physics
	23UPH54EG01B	Generic Elective-1: Renewable Energy Physics

*Offered to students from other Departments

ANNEXURE 3
Generic Elective - 2*

Department	Course Code	Title of the Course
Botany	23UBO64EG02	Generic Elective - 2: Solid Waste Management
Computer Science	23UCS64EG02	Generic Elective - 2: 3D Printing and Design
BCA	23UBC64EG02	Generic Elective - 2: Industry 4.0
Mathematics	23UMA64EG02	Generic Elective - 2: Quantitative Techniques
Statistics	23UST64EG02	Generic Elective - 2: Applied Statistics
Vis Com	23UVC64EG02	Generic Elective - 2: Digital Media Production
English	23UEN64EG02	Generic Elective - 2: English for the Media
History	23UHS64EG02	Generic Elective - 2: Intellectual Revivalism in Tamil Nadu
Tamil	23UTA64EG02	Generic Elective - 2: தமிழர் மருத்துவம் (Tamil Medicine)
BBA	23UBU64EG02A	Generic Elective - 2: Personality Development
	23UBU64EG02B	Generic Elective - 2: NGO Management
B. Com	23UCO64EG02A	Generic Elective - 2: Rural Marketing
	23UCO64EG02B	Generic Elective - 2: Entrepreneurship Development
	23UCO64EG02C	Generic Elective - 2: Digital Marketing
B. Com CA	23UCC64EG02	Generic Elective - 2: Total Quality Management
Economics	23UEC64EG02	Generic Elective - 2: Economics for Competitive Exams
Electronics	23UEL64EG02A	Generic Elective - 2: CCTV and Smart Security Systems
	23UEL64EG02B	Generic Elective - 2: Entrepreneurial Electronics
Physics	23UPH64EG02A	Generic Elective - 2: Laser Technology and its applications
	23UPH64EG02B	Generic Elective - 2: Physics of Earth

*Offered to students from other Departments

ANNEXURE 4
Skill Enhancement Course - 3 (WS)*

School	Course Code	Title of the Course
SPS	23UEL64SE02A	Skill Enhancement Course - 3 (WS): Lab Equipment Maintenance and Servicing
	23UEL64SE02B	Skill Enhancement Course - 3 (WS): PC Assembling and Servicing
	23UPH64SE02A	Skill Enhance Course - 3: (WS): Radiation Physics and Safety
	23UPH64SE02B	Skill Enhance Course - 3: (WS): Non-Destructive Testing

**Offered to students from other Departments within School*

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UTA11GL01A	General Tamil - 1	5	3

கற்றலின் நோக்கங்கள்
தமிழ்ச் செவ்வியல் இலக்கியங்களையும் காப்பியங்களையும் மாணவர்கள் அறிந்துகொள்ளல்
தமிழர் பேணி வளர்த்த அறம்சார் விழுமியங்களை மாணவர்கள் தம் வாழ்வில் பின்பற்றுதல்
தமிழில் பக்திஇயக்கப் பங்களிப்பையும் பகுத்தறிவுச் சிந்தனை மரபையும் உணர்தல்
மாணவர்கள் தம் எழுத்தாற்றலையும் மொழிப்புலமையையும் வளர்த்தெடுத்தல்
போட்டித்தேர்வுகளை எதிர்கொள்ளும் வகையில் இலக்கணம், இலக்கியம் கற்றல்

அலகு - 1 தமிழ் இலக்கிய, இலக்கண வரலாறு அறிமுகம்.

(10 மணி நேரம்)

1. இலக்கணம் :

அ.தொல்காப்பியம், இறையனார் களவியல் உரை , நம்பியகப் பொருள், புறப்பொருள் வெண்பா மாலை, நன்னூல், தண்டியலங்காரம், யாப்பருங்கலக்காரிகை- நூல்கள்

ஆ.மொழிப் பயிற்சி- ஒற்றுப்பிழை தவிர்த்தல்

- வல்லினம் மிகும் இடங்கள்
- வல்லினம் மிகா இடங்கள்
- ஈரொற்று வரும் இடங்கள்
- ஒரு, ஓர் வரும் இடங்கள்
- அது, அஃது வரும் இடங்கள்
- தான், தாம் வரும் இடங்கள்

பயிற்சி : வல்லினம் மிகும் இடங்கள், மிகா இடங்கள் தவறாக வரும்வகையில் ஒரு பத்தி கொடுத்து ஒற்றுப் பிழை திருத்தி எழுதச் செய்தல்.

2. சங்க இலக்கியம் - எட்டுத்தொகை, பத்துப்பாட்டு

3. அற இலக்கியம்-பதினெண்கீழ்க்கணக்கு நூல்கள்

4. காப்பிய இலக்கியம் - ஐம்பெருங் காப்பியங்கள், ஐஞ்சிறு காப்பியங்கள், சமயக் காப்பியங்கள்

5. பக்தி இலக்கியமும் (பன்னிரு திருமுறைகள், நாலாயிர திவ்வியப் பிரபந்தம் -- பகுத்தறிவு இலக்கியமும் (சித்தர் இலக்கியங்கள், புலவர் குழந்தையின் இராவண காவியம்)

அலகு - 2 சங்க இலக்கியம்

(15 மணி நேரம்)

எட்டுத்தொகை :

6. நற்றிணை-முதல் பாடல் -நின்ற சொல்லர்

7. குறுந்தொகை 3 ஆம் பாடல் -நிலத்தினும் பெரிதே

8. ஐங்குறுநூறு -நெல் பல பொலிக! பொன் பெரிது சிறக்க!" (முதல் பாடல்)-வேட்கைப் பத்து

9. கலித்தொகை- 51 - சுடர்த்தொடிக் கேளாய் -குறிஞ்சிக் கலி

10. புறநானூறு -189 தெண்கடல் வளாகம் பொதுமையின்றி, நாடா கொன்றோ -187

பத்துப்பாட்டு:

முல்லைப்பாட்டு (முழுவதும்)

அலகு - 3 அற இலக்கியம்

(10 மணி நேரம்)

12. திருக்குறள் -அறன் வலியுறுத்தல் அதிகாரம்

13. நாலடியார்-பாடல்: 131 (குஞ்சியழகும்)

14. நான்மணிக்கடிகை-நிலத்துக்கு அணியென்ப

15. பழமொழி நானூறு- தம் நடை நோக்கார்

16. இனியவை நாற்பது- 37. இளமையை மூப்பு என்று

அலகு - 4 காப்பிய இலக்கியம்

(20 மணி நேரம்)

17. சிலப்பதிகாரம் – வழக்குரைகாதை
18. மணிமேகலை- பாத்திரம் பெற்ற காதை
19. பெரியபுராணம் - பூசலார் நாயனார்புராணம்
20. கம்பராமாயணம்- குகப் படலம்
21. சீறாப்புராணம் – மானுக்குப் பிணை நின்ற படலம்
22. இயேசு காவியம் -ஊதாரிப்பிள்ளை

அலகு - 5 பக்தி இலக்கியமும், பகுத்தறிவு இலக்கியமும்

(15 மணி நேரம்)

23. பக்தி இலக்கியம்:

- திருநாவுக்கரசர் தேவாரம் - நாமார்க்கும் குடியல்லேம் எனத் தொடங்கும் பாடல் மட்டும்
- மாணிக்கவாசகர் கிருவாசகம் - நமச்சிவாய வாழ்க நாதன்தான் வாழ்க முதல் சிரம்குவிவார் ஓங்குவிக்கும் சீரோன் கழல் வெல்க வரை
- பொய்கையாழ்வார்-வையந் தகளியா வார்கடலே
- பூதத்தாழ்வார்-அன்பே தகளியா
- பேயாழ்வார்-திருக்கண்டேன் பொன்மேனி கண்டேன்
- ஆண்டாள் – திருப்பாவை மார்கழித் திங்கள் (முதல் பாடல்)

24. பகுத்தறிவு இலக்கியம் :

- திருமூலர் – திருமந்திரம் (270,271, 274, 275 285)
- பட்டினத்தார் -திருவிடை மருதூர் (காடே திரிந்து – எனத் தொடங்கும் பாடல்
- பா.எண்.279, 280)
- கடுவெளி சித்தர் - பாபஞ்செய் யாதிரு மனமே (பாடல் முழுவதும்)
- இராவண காவியம் – தாய்மொழிப் படலம் - 18. (ஏடுகை யில்லா ரில்லை முதல் - 22. செந்தமிழ் வளர்த்தார் வரை)

கற்பித்தல் முறை	விரிவுரை (Lecture), காணொளிக் காட்சி (Videos), விளக்கக் காட்சி (PPT presentation)
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பாடநூல்

1. பொதுத்தமிழ்-1 (தமிழ் இலக்கிய வரலாறு-1), தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி – 620 002, முதற்பதிப்பு - 2023
2. பார்வை நூல்கள்
3. வரதராசன்.மு., தமிழ் இலக்கிய வரலாறு, சாகித்ய அக்காதெமி, புதுடெல்லி. 2021
4. விமலானந்தன். மது. ச., தமிழ் இலக்கிய வரலாறு, முல்லை நிலையம், சென்னை, 2019
5. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, பாரி நிலையம், சென்னை, 2022
6. சிற்பி பாலசுப்பிரமணியன் & சேதுபதி.சொ., தமிழ் இலக்கிய வரலாறு, கவிதா வெளியீடு, சென்னை, 2015
7. சிற்பி பாலசுப்பிரமணியன், & பத்மநாபன். நீல., புதிய தமிழ் இலக்கிய வரலாறு (3 தொகுதிகள்), சாகித்ய அக்காதெமி, புதுடெல்லி,2013
8. பெருமாள். அ.கா., தமிழ் இலக்கிய வரலாறு, சுதர்சன் புகல், நாகர்கோவில், 2014
9. ஏசுதாசன். ப.ச., தமிழ் இலக்கிய வரலாறு, நியூ செஞ்சரி புக ஹவுஸ், சென்னை, 2015
10. ஸ்ரீகுமார். எஸ்., தமிழ் இலக்கிய வரலாறு, ஸ்ரீசெண்பகா பதிப்பகம், சென்னை, 2014
11. பாக்கியமேரி எஃப்., வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, பூவேந்தன் பதிப்பகம், சென்னை,2022
12. சுப்புரெட்டியார்.ந., தமிழ் பயிற்றும் முறை, மணிவாசகர் நூலகம், சிதம்பரம், 1980

Websites and eLearning Sources

1. <https://www.chennaiLibrary.com/>
2. <https://www.sirukathaigal.com>
3. <https://www.tamilvirtualuniversity.org>
4. <https://www.noolulagam.com>
5. <https://www.katuraitamilblogspot.com>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
C01	சங்க இலக்கியங்கள்வழி பண்டைத்தமிழரின் வாழ்வியலையும் பண்பாட்டையும் அறிந்து கொள்வர்	K1
C02	அற இலக்கியங்கள், காப்பியங்கள் வெளிப்படுத்தும் அறம்சார் விழுமியங்களைத் தம் வாழ்வில் பின்பற்றுவர்	K2
C03	இலக்கணக் கோட்பாடுகளை இக்கால வாழ்வியலோடு பொருத்திப் பார்ப்பர்	K3
C04	மொழியறிவோடு பெறுவர் திறன் பகுத்தாராயும் இலக்கியங்களைப்	K4
C05	பக்தி இயக்கங்களின் செல்வாக்கையும், தமிழரின் பகுத்தறிவு மரபையும் மதிப்பிடுவர்	K5

Relationship Matrix												
Semester	Course Code		Title of the Course								Hours	Credits
1	23UTA11GL01A		General Tamil - 1								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		
C01	1	2	3	2	2	3	3	2	2	2	2.2	
C02	2	2	3	2	2	2	3	2	3	2	2.3	
C03	1	2	2	3	2	2	2	3	3	3	2.3	
C04	2	2	3	2	2	3	2	3	3	2	2.4	
C05	3	1	2	2	2	2	3	2	3	3	2.3	
Mean Overall Score											2.3 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UFR11GL01	French - 1	5	3

Course Objectives
Identify the basic French sentence structure
Define and describe the various grammatical tenses and use them to communicate in French
Examine the various documents presented and discuss and reply to the questions asked on it
Analyze and interpret expressions used to convey the cause, the effect, the purpose, and the opposition in French
Evaluate the grammatical nature present in passages

UNIT I (15 Hours)

- Salut ! Enchanté

UNIT II (15 Hours)

- J'adore

UNIT III (15 Hours)

- Tu veux bien ?

UNIT IV (15 Hours)

- On se voit quand ?

UNIT V (15 Hours)

- Bonne idée

Teaching Methodology	Videos, Audios, PPT presentation, Role-play, Quiz
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Book for Study

1. Mérieux, R. & Loiseau, Y. (2017). *Latitudes -1- (A1 /A2)*, méthode de français, Didier. (Units 1 - 6 only)

Books for Reference

1. P.Dauda, L.Giachino and C.Baracco, *Generation AI*, Didier, Paris 2020.
2. J.Girardet and J.Pecheur, *Echo AI*, CLE International, 2^eedition ,2017
3. Isabelle Fournier, *Talk French*, Goyal Publishers, 2011

Websites and eLearning Sources

1. <https://www.wikihow.com/Pronounce-the-Letters-of-the-French-Alphabet>
2. <https://français.lingolia.com/en/grammar/tenses/le-present>
3. <https://www.lawlessfrench.com/grammar/articles/>
4. <https://www.frenchpod101.com/french-vocabulary-lists/10-lines-you-need-for-introducing-yourself>
5. <https://www.tolearnfrench.com/exercices/exercice-french-2/exercice-french-3295.php>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	recall and remember the usage of grammatical tenses in constructing sentences in a dialogue.	K1
CO2	apply the learnt grammar rules in practice exercises to improve their understanding	K2
CO3	explain the nuances in the usage of various grammatical tenses and their aspects	K3
CO4	demonstrate knowledge of various expressions used to express opinions, emotions, cause, effect, purpose, and hypothesis in French	K4
CO5	communicate in French and summarize a given text	K5

Relationship Matrix												
Semester	Course Code	Title of the Course					Hours	Credits				
1	23UFR11GL01	French - 1					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	3	1	3	1	3	3	2	3	2	2.4	
CO2	2	3	3	2	1	3	3	3	3	2	2.5	
CO3	1	3	2	1	2	2	2	2	3	2	2.0	
CO4	3	3	3	3	3	3	3	2	3	2	2.8	
CO5	3	3	3	3	2	3	3	3	3	2	2.8	
Mean Overall Score											2.5 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UHI11GL01	Hindi - 1	5	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 Hindu Literature
To empower the students with globally employable soft skills

UNIT I: Buniyadi Hindi (15 Hours)

- Swar
- Vyanjan
- Barah Khadi
- Shabd aur
- Vakya Rachna

UNIT II: Hindi Shabdavali (15 Hours)

- Rishto ke Naam
- Gharelu padartho ke Naam

UNIT III: Vyakaran (15 Hours)

- Sadharan Vakya aur Sangya
- Sarvanam
- Visheshan
- Kriya aadi shabdo ka prayog

UNIT IV: Chote Gadyansh ka pattan (15 Hours)

- Bacho ki Kahaniya
- Patra-Patrikao mein prakashit Gadyansho ka Pathan

UNIT V: Nibandh (15 Hours)

- Sant Tiruvalluvar
- E.V.R Thandai Periyar
- Naari Sashaktikaran
- Paryavaran Sanrakshan
- Vibhinna pratiyogi parikshao ke bare mein jaankari dena
- Pratiyogi priksa par adharit nibandho dwara bhasha ki kshamta badhane vale prashikshan kary.

Teaching Methodology	Videos, PPT, Quiz, Group Discussion, Project Work.
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Books for Study

1. Gupt, M.K. (2020). *Hindi Vyakaran*, Anand Prakashan, Kolkatta.
2. Tripaty, V. (2018). *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd, New Delhi.
3. Jain, S.K. (2019). *Anuwad: Siddhant Evam Vyavhar*, Kailash Pustak Sadan, Madhya Pradesh.

Books for Reference

1. Abdul Kalam, A. P.J. (2020). *Mere sapnom ka Bharath*, Prabath Prakashan, Noida.
2. Singh, L.P. (2017). *Kavya ke sopan*, Bharathy Bhavan Prakashan.

3. Kumar, A. (2019). *Sampoorna Hindi Vyakaran our Rachana*, Lucent publisher.
4. (2018). *Adhunik Hindi Vyakaran our Rachana*, Bharati Bhavan Publishers & distributors.
5. Shukla, A.R. (2022). *Hindi Sahitya Ka Itihas*, Prabhat Prakashan.

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 - Level)
	On successful completion of the course, the student will be able to	
CO1	introduction to Hindi sounds	K1
CO2	acquisition of Hindi Vocabulary	K2
CO3	sentence formation in Hindi	K3
CO4	reading of stories and other passages	K4
CO5	modules to increase language ability through general essays based on competitive exams	K5

Relationship Matrix											
Semester	Course Code		Title of the Course					Hours	Credits		
1	23UHI11GL01		Hindi - 1					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	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	23USA11GL01	Sanskrit - 1	5	3

Course Objectives

• To help the students learn the alphabets of Sanskrit.
• To understand the Sanskrit grammar and sabdas.
• To have an idea of the epics.
• To closely understand the literary works in Sanskrit with special reference to Pancamahakavyas.
• To understand the Raghuvasa Mahakava and Kalidasa.

UNIT I (15 Hours)

- **Introduction to Sanskrit (Alphabets, Two letter words and three letter words)**
- **Grammar:**
- *ākārāntaḥpumlīṅgaḥśabda-s* - 1. बाल (Bāla) and 2. देवे (Deva) *ākārāntaḥstrīlīṅgaḥśabda-s* - 1. बाला (Bālā) and 2. लता (Latā) *ākārāntaḥnapumsakalīṅgaḥśabda-s* - 1. फल (Phala) and 2. वन (Vana)

UNIT II (15 Hours)

- **Introduction to Rāmāyana, Kālidāsa and his poetic works**
Text: *Raghuvamśa* (Canto I) Verses 1-15

UNIT III (15 Hours)

- **Introduction to the works of Bhāravi -**
Text: *Raghuvamśa* (canto I) Verses 16-30

UNIT IV (15 Hours)

- **Introduction to the works of ŚrīHarṣha -**
Text: *Raghuvamśa* (Canto I) Verses 31-45

UNIT V (15 Hours)

- **Grammar:**
- Conjugations -*Laṭlakāra-s* – (Present tense)
- (i) गच्छत (Gacchati) (ii) ततष्ठत (Tiṣṭhati) (iii) पठत (Paṭhati)
- (iv) नृत्यत (Nr̥tyati) (v) कुप्यत (Kupyati) (vi) कथयत (Kathayati)
- (vii) गणयत (Gaṇayati) (viii) अतत (Asti)
- (ix) करोत (Karoti) (x) शृणोत (Śr̥ṇoti)
- Indeclinables (Avyayaani) - अतप (api), कदा (kadā), च (ca), अद्य (adya), तवना (vinā), सह (saha), तत्र (tatra), कम् (kim), यद् (yadi) - तर्ह (tarhi), यथा (yathā) - तथा (tathā) Prefixes (Upasargas) - आङ् (āñ), तव (vi), परर (pari), अनु (anu), अति (adhi), उत् (ut), प्रत (prati), उप (upa), प्र (pra) तनर् (nir)

Teaching Methodology	Videos, PPT, demonstration.
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Book for Study

1. Murugan, C., et al. (eds.). (2022). *Kalasala Samskrta Sukha Bodhini I* (for under graduate foundation course) Published by University of Madras.

Book for Reference

1. Vadhyar, R.S. (2017). *Shabdha manjari*, R.S. Vadyar & Sons, Palakkad.

Websites and e-Learning Sources

1. <https://www.arlingtoncenter.org/Sanskrit%20Alphabet.pdf>
2. <https://courses.lumenlearning.com/suny-hccc-worldcivilization/chapter/sanskrit/>
3. https://www.newworldencyclopedia.org/entry/Sanskrit_literature
4. <https://archive.org/details/AShortHistoryOfsanskritLiterature>
5. https://archive.org/details/raghuvamsha_with_sanjivini_edited_by_mr_kale

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	remember the usage of grammatical tenses in constructing sentences in dialogue.	K1
CO2	apply the rules of usage in practice exercises and identify errors	K2
CO3	explain the nuances in the usage of various grammatical tenses and aspects	K3
CO4	demonstrate knowledge of various expressions of opinion, emotions, cause, effect, purpose, and hypothesis in French	K4
CO5	communicate in French and summarize the given text	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23USA11GL01	Sanskrit - 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	1	3	2	3	1	3	2	3	2	2	2.1	
CO2	2	3	2	3	1	2	2	3	2	3	2.5	
CO3	3	2	2	2	2	2	3	2	3	2	2.1	
CO4	3	2	3	2	2	3	3	2	3	2	2.4	
CO5	3	2	3	3	2	2	3	2	3	3	2.3	
Mean Overall Score											2.34 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UEN12GE01	General English - 1	5	3

Course Objectives

To enable learners to acquire self awareness and positive thinking required in various life situations

To help them acquire the attribute of empathy

To assist them in acquiring creative and critical thinking abilities

To enable them to learn the basic grammar

To assist them in developing LSRW skills

UNIT I: Self-awareness ELF-A (WHO) & Positive Thinking (UNICEF) (15 Hours)

Life Story

- Chapter 1 from Malala Yousafzai, I am Malala
- An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3) M.K. Gandhi

Poem

- Where the Mind is Without Fear – Gitanjali 35 – Rabindranath Tagore
- Love Cycle – Chinua Achebe

UNIT II: Empathy (15 Hours)

Poem

- Nine Gold Medals – David Roth
- Alice Fell or poverty – William Wordsworth

Short Story

- The School for Sympathy – E.V. Lucas
- Barn Burning – William Faulkner

UNIT III: Parts of Speech (15 Hours)

- Articles
- Noun
- Pronoun
- Verb
- Adverb
- Adjective
- Preposition

UNIT IV: Critical & Creative Thinking. (15 Hours)

Poem

- The Things That Haven't Been Done Before – Edgar Guest
- Stopping by the Woods on a Snowy Evening – Robert Frost

Readers Theatre

- The Magic Brocade – A Tale of China
- Stories on Stage – Aaron Shepard (Three Sideway Stories from Wayside School" by Louis Sachar)

Unit V: Paragraph and Essay Writing (15 Hours)

- Descriptive
- Expository
- Persuasive
- Narrative
- Reading Comprehension

Teaching Methodology	Interactive methods, and multimedia presentations
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Books for Study

1. Yousafzai, M. (2013). *I am Malala*, Little. Brown and Company.
2. Gandhi, M. K. (2011). *An Autobiography or The Story of My Experiments with Truth (Chapter - I)*. Rupa Publications.
3. Tagore, R. (1913). "*Gitanjali 35*" from *Gitanjali (Song Offerings): A Collection of Prose Translations Made by the Author from the Original Bengali*. MacMillan.
4. Shepard, A. (2017). *Stories on Stage*. Shepard Publications.

Books for Reference

1. Krishnasamy. N. (1975). *Modern English: A Book of Grammar, Usage and Composition*. Macmillan.
2. Nesfield, J. C. (2019). *English Grammar Composition and Usage*. Macmillan.

Websites and eLearning Sources

1. <https://archive.org/details/i-am-malala>
2. <https://www.indiastudychannel.com/resources/146521-Book-Review-An-Autobiography-or-The-story-of-my-experiments-with-Truth.aspx>
3. <https://www.poetryfoundation.org/poems/45668/gitanjali-35>
4. <https://amzn.eu/d/9rVzINv>
5. <https://archive.org/details/in.ernet.dli.2015.44179>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	discover self awareness and positive thinking required in various life situations	K1
CO2	classify the attributes of empathy	K2
CO3	apply creative and critical thinking skills	K3
CO4	focus on grammar for functional purposes	K4
CO5	integrate the LSRW skills for effective communication	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UEN12GE01	General English - 1									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	3	3	3	3	3	3	3	3	3	3	
CO2	2	3	3	3	2	3	3	3	3	3	2.5	
CO3	3	3	3	2	3	3	3	3	3	2	2.8	
CO4	3	3	3	3	3	3	3	3	3	3	3	
CO5	3	2	3	3	3	3	3	3	3	3	2.8	
Mean Overall Score											2.82 (High)	

Semester	Course code	Title of the Course	Hours/Week	Credits
1	23UCH13CC01	Core Course - 1: General Chemistry - 1	5	3

Course Objectives
To understand the various atomic models and atomic structure
To know about the wave particle duality of matter
To discuss periodic table, periodicity in properties and its application in explaining the chemical behaviour
To highlight nature of chemical bonding
To familiarize about fundamental concepts of organic chemistry

UNIT I: Atomic Structure and Periodic Trends (15 hours)

History of atom (J.J. Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter - De-Broglie wavelength - Davisson and Germer experiment- Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions - Hund's rule, Pauli's exclusion principle and Aufbau principle. Numerical problems involving the core concepts.

UNIT II: Introduction to Quantum Mechanics (15 Hours)

Classical mechanics, Wave mechanical model of atom, distinction between Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of Schrodinger wave equation - Probability and electron density - visualizing the orbitals - Probability density and significance of Ψ and Ψ^2 . Modern Periodic Table: Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size - Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity - electronegativity scales, applications of electronegativity. Problems involving the core concepts.

UNIT III: Structure and Bonding - I (15 Hours)

Ionic bond: Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle - lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation - polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts. Covalent bond: Shapes of orbitals - overlap of orbitals - σ and Π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB_2 , AB_3 , AB_4 , AB_5 , AB_6 and AB_7 . Partial ionic character of covalent bond - dipole moment, application to molecules of the type A_2 , AB , AB_2 , AB_3 , AB_4 ; percentage ionic character - numerical problems based on calculation of percentage ionic character.

UNIT IV: Structure and Bonding - II (15 Hours)

VB theory - application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species - CO_2 , NO_2 , CO_3^{2-} , NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2 , C_2 , O_2 , O_2^+ , O_2^- , O_2^{2-} , N_2 , NO , HF , CO ; magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3 , NH_3 , NH_4^+ , H_3O^+ properties. Metallic bond electron sea model, VB model; Band theory - mechanism of conduction in solids; conductors, insulator, semiconductor - types, applications of semiconductors. Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding - Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT V: Basic Concepts In Organic Chemistry And Electronic Effects (15 Hour)

Types of bond cleavage - heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates - carbanions, carbocations, carbenes, arynes and nitrynes. Inductive effect - reactivity of alkyl halides,

acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance - resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance. Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane. Types of organic reactions - addition, substitution, elimination and rearrangements.

Teaching Methodology	Interactive videos, PPT, demonstration and creation of models
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Books for Study

- Madan, R. D., & Prakash, S. (2003). *Modern inorganic chemistry*, (2nd Ed.). S. Chand & Company.
- Rao, C. N. R. (2000). *University General Chemistry*. Macmillan Publication.
- Puri, B. R., & Sharma, L. R. (2002). *Principles of physical chemistry*, (38th Ed.) Vishal Publishing Company.
- Bruce, P. Y., & Prasad, K. J. R. (2008). *Essential organic chemistry*. Pearson Education.
- Dash, U. N., Dharmarha, O. P., & Soni P. L. (2016). *Textbook of physical chemistry*. Sultan Chand & Sons.
- Lee, J. D. (1991). *Concise inorganic chemistry*, (4th Ed.). ELBS William Heinemann.
- Atkins, P. W., & Paula, J. (2014). *Physical chemistry*, (10th Ed.). Oxford University Press.

Books for Reference

- Maron, S. H., & Prutton C. P. (1972). *Principles of physical chemistry*, (4th Ed.). The Macmillan Company.
- Raj, G. (2001). *Advanced inorganic chemistry*, (26th Ed.). Goel Publishing House.
- Huheey, J. E., (1993). *Inorganic chemistry: Principles of structure and reactivity*, (4th Ed.). Addison-Wesley Publishing Company.

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 atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.	K1
CO2	classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.	K2
CO3	apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electronegativity, percentage ionic character and bond order.	K3
CO4	evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects	K4
CO5	construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H - bonding and organic reaction mechanisms.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UCH13CC01	Core Course -1: General Chemistry - 1									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	2	2	2	2	2	3	2	1	2.1	
CO2	2	2	2	3	2	3	2	2	2	3	2.3	
CO3	3	3	3	2	2	3	3	3	2	3	2.7	
CO4	2	2	2	2	2	2	3	3	2	2	2.2	
CO5	3	3	3	2	2	3	2	3	2	2	2.5	
Mean Overall Score											2.3 (High)	

Semester	Course code	Title of the Course	Hours/Week	Credits
1	23UCH13CP01	Core Practical -1: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	3	3

Course Objectives

To learn laboratory safety
To learn to handle glassware in chemistry laboratory
To know the principles behind the quantitative estimation of inorganic compounds
To analyze active ingredients in some pharmaceutical formulations like iron content in iron tablets.
To know the preparative methods of simple inorganic compounds

UNIT I: Chemical Laboratory Safety in Academic Institutions

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

Common Apparatus Used in Quantitative Estimation (Volumetric)

Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.

Principle of Quantitative Estimation (Volumetric)

Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators - types, theory of acid-base, redox, metal ion and adsorption indicators, choice of indicators.

UNIT II: Quantitative Estimation (Volumetric)

- Preparation of standard solution, dilution from stock solution Permanganometry
- Estimation of sodium oxalate using standard ferrous ammonium sulphate Dichrometry
- Estimation of ferric alum using standard dichromate (external indicator)
- Estimation of ferric alum using standard dichromate (internal indicator) Iodometry
- Estimation of copper in copper sulphate using standard dichromate Argentimetry
- Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)

UNIT III: Complexometry

- Estimation of hardness of water using EDTA
- Estimations
- Estimation of iron in iron tablets
- Estimation of ascorbic acid.
- Preparation of Inorganic compounds
- Potash alum
- Tetraammine copper (II) sulphate
- Hexamminecobalt (III) chloride
- Mohr's Salt

Books for Study

1. Venkateswaran, V., Veeraswamy, R., & Kulandivelu, A. R. (1997). *Basic principles of practical chemistry*, (2nd Ed.). Sultan Chand & Sons.
2. Nad, A. K., Mahapatra, B., & Ghoshal, A. (2007). *An advanced course in practical chemistry*,

(3rd Ed.). New Central Book Agency.

Book for Reference

1. Mendham, J. *et al.* (2000). *Textbook of quantitative chemical analysis*, (6th Ed.). Pearson Education Ltd.

Websites and eLearning Resources

1. <http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis>
2. <https://chemdictionary.org/titration-indicator/>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, the students will be able to	
CO1	recall the basic principles of laboratory safety	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 basics, methodology and procedure of simple inorganic compounds.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UCH13CP01	Core Practical - 1: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations									3	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	2	3	1	2	2	2	2.2	
CO2	3	3	2	2	2	2	3	2	2	3	2.4	
CO3	2	2	3	3	2	2	3	2	2	2	2.3	
CO4	3	2	2	3	2	2	1	3	2	2	2.2	
CO5	3	1	2	3	2	1	2	2	3	3	2.2	
Mean Overall Score											2.26 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UCH13AC01	Allied Course - 1: Mathematics for Chemistry - 1	6	4

Course Objectives
Training the students in mastering the techniques of various branches of Mathematics
Motivating the students to apply the techniques in their respective major subjects
Introducing the basic knowledge of differentiation
Understanding the concept of matrices and its applications
Solving 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 $\sin\theta$ and $\cos\theta$ 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 method, PPT
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Book for Study

- Narayanan, S., Rao, S. H., & Pillay, T. K. M. (2009). *Ancillary mathematics vol.-I*. Viswanathan, S., Printers & Publishers Pvt Ltd.
Unit I: Chapter 1, Sections 1.1 - 1.2 (Page No: 1 - 27)
Unit II: Chapter 1, Sections 1.3 - 1.4 (Page No: 28 - 53)
Unit III: Chapter 3, Sections 3.2 - 3.4 (Page No: 137 - 160)
Unit IV: Chapter 5, Sections 5.1 - 5.3 (Page No: 220 - 242)
Unit V: Chapter 6, Section 6.1 (Page No: 266 - 281)

Books for Reference

- Pillay, T. K. M., Natarajan, T., & Ganapathy, K. S. (2013). *Algebra vol - I*. Viswanathan, S., Printers & Publishers Pvt Ltd.
- Narayanan, S. & Pillay, T. K. M., (2013). *Calculus vol - I*. Viswanathan, S., Printers & Publishers Pvt Ltd.
- Narayanan, S., & Pillay, T. K. M. (2013). *Trigonometry*. Viswanathan, S., Printers & Publishers Pvt Ltd.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, the students will be able to	
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, eigen vectors, summation of series in solving problems on chemistry.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UCH13AC01	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	23UCH14FC01	Foundation Course: Fundamentals of Chemistry	2	1

Course Objectives

To understand the basic concentration terms in volumetric analysis
To practice using the chemicals in laboratory
To understand the significance of modern periodic table.
To analyse different methods of volumetric techniques
To understand the structure of organic compounds on the basis of hybridization

UNIT I: Concentration Terms (6 Hours)

International system of units, The distinction between mass and weight, The Mole, Calculating amount of substances in moles, and molecular weight calculations, Molar volume, oxidation number, Concentration of solutions- molality, molarity, normality, mole fraction and parts per million, parts per billion.

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 pipet, buret and volumetric flask.

UNIT III: Periodic Table (6 Hours)

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

UNIT IV: Volumetric Analysis (6 Hours)

Principles of Titrations, Theory of Indicators, Types of Titrations - Acidimetry, Alkalimetry, Permanganometry, Dichrometry, Iodometry, Argentometry, Complexometry. Error analysis: Accuracy, Precision, Error: Types of Errors.

UNIT V: Basics of Organic Chemistry (6 Hours)

Ionic, covalent, and polar bonds, dipole moment, Lewis structures, atomic orbitals, an introduction to molecular orbital theory, hybridization concept (Example, methane, ethane, ethylene and acetylene), Electrophile, nucleophile

Teaching Methodology	Interactive videos, PPT, demonstration and creation of models
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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. Lee, J. D. (1991). *Concise inorganic chemistry*, (4th Ed.). ELBS William Heinemann,
3. Morrison, R. T., & Boyd, R. N. (1987). *Organic chemistry*, (4th Ed.). Prentice-Hall of India, Pvt, Ltd.
4. Bruice, P. Y. (2007). *Organic chemistry*, (4th Ed.). Pearson Education, Inc.

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.

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	recall the basics of laboratory operations	K1
CO2	remember the basic concentration terms in volumetric analysis	K2
CO3	identify the properties of elements in the periodic table	K3

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UCH14FC01	Foundation Course: Fundamentals 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	
Mean Overall Score											2.3 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UHE14VE01	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 a holistic development
To assimilate human values comprehensively

UNIT I: Principles of 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: Development of Human Personality (6 Hours)

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

UNIT III: The Dimensions of Human Development (6 Hours)

Areas of Development: Physical, Intellectual, Emotional, Social Development, Moral & Spiritual development

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	Chalk and Talk, Power point
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Book for Study

1. Department of Human Excellence. (2021). *Essentials of Humanity*. St. Joseph's College.

Books for Reference

1. Xavier, A. (2012). *You Shall Overcome*, (6th Ed.). ICRDE Publication.
2. Alex, K. (2009). *Soft Skills*. S. Chand.
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. <http://www.apa.org/topics/personality#>. Accessed 05 March 2021.
3. <http://www.peacecorps.gov/educators/resources/global-issues-gender-equaligy-and-womens-empowerment/>. Accessed 05 March 2021.

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 their 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	23UHE14VE01	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)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UEN14AE01	Ability Enhancement Compulsory Course - 1: Communicative English	6	3

Course Objectives

To recognize and identify the components of a formal letter.

To summarize the main points of a given letter and identify the intended meaning.

To use appropriate grammatical structures in context within their own writing.

To compare and contrast the elements of successful and unsuccessful letters.

To create well-structured letters with clear purpose and effectively evaluate and revise their own writing.

Basic Level

UNIT I (18 Hours)

- 1) A letter to avail college hostel
- 2) A requisition letter to provide fee concession
- 3) A requisition letter to provide Bonafide certificate
- 4) A letter to avail resources in college library
- 5) An On Duty Permission Letter
- 6) Nouns
- 7) Pronouns
- 8) Adjectives
- 9) Verbs
- 10) Adverbs

UNIT II (18 Hours)

- 11) A letter to provide conduct certificate
- 12) A letter to provide new ID card
- 13) A Permission letter for Name Correction in Mark sheet
- 14) A permission letter for Sports Events
- 15) A letter to avail permission for the Shepherd programme
- 16) Prepositions
- 17) Conjunctions
- 18) Articles
- 19) Conjugation of present form 'Be' verbs
- 20) Conjugation of past form 'Be' verbs

UNIT III (18 Hours)

- 21) A letter to avail the College Hostel
- 22) A permission letter to join the sport team
- 23) A request letter to access college Wi-Fi
- 24) A letter to vice principal requesting to change Elective course
- 25) A permission letter for project extension
- 26) Conjugation of future form 'Be' verbs
- 27) Conjugation of present continuous 'Be' verbs
- 28) Conjugation of Past continuous 'Be' verbs
- 29) Conjugation of Future continuous 'Be' verbs
- 30) Conjugation of Present Perfect 'Be' verbs

UNIT IV (18 Hours)

- 31) An apology letter to Dean for using mobile phone
- 32) A request letter to repair fan and tube light

- 33) A letter to invite Chief guest for Bibliophile Club meeting
- 34) A requisition Letter to issue the Transfer certificate
- 35) A permission letter for group exam coaching class
- 36) Conjugation of Past Perfect 'Be' verbs
- 37) Conjugation of Future Perfect 'Be' verbs
- 38) Conjugation of Present Perfect Continuous 'Be' verbs
- 39) Conjugation of Past Perfect Continuous 'Be' verbs
- 40) Conjugation of Future Perfect Continuous 'Be' verbs

UNIT V

(18 Hours)

- 41) A letter seeking help to find the missing laptop
- 42) A letter to the editor regarding frequent power cut
- 43) A medical leave letter
- 44) A requesting OD Letter to issue invitation to other colleges
- 45) A requisition letter to change Shift
- 46) Conjugation of present form 'Action' verbs
- 47) Conjugation of past form 'Action' verbs
- 48) Conjugation of Present form 'do' verbs
- 49) Conjugation of Past form 'do' verbs
- 50) Conjugation of Future form 'have' verbs

Teaching Methodology	Chalk and Talk, discussion, Training
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Book for Study

1. Jayapaul, V.L. (2023). *Begin to Learn English*. St. Joseph's College (Autonomous), Tiruchirappalli.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	compose various types of letters (request, permission, and apology) demonstrating clarity, coherence, and correctness.	K1
CO2	exhibit a sound understanding of nouns, pronouns, adjectives, verbs, and adverbs, utilizing them accurately in written and spoken English.	K2
CO3	apply language skills in real-life college scenarios, gaining confidence in communicating effectively with peers, faculty, and administrative staff.	K3

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UEN14AE01	Ability Enhancement Compulsory Course - 1: Communicative English									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	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	
Mean Overall Score											2.37 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UEN14AE01	Ability Enhancement Compulsory Course - 1: Communicative English	6	3

Course Objectives

To recognize and identify common punctuation marks and their usage in paragraphs.
To summarize the main topics introduced in a paragraph and demonstrate understanding.
To apply the learned concepts to construct paragraphs that convey ideas effectively.
To analyze paragraphs to identify the role of prefixes, suffixes, and noun types in enhancing meaning.
To synthesize information to create paragraphs, evaluate their own writing, and engage in role-playing scenarios to demonstrate understanding.

Intermediate Level

UNIT I		(18 Hours)
1) Paragraph Punctuation		
2) Introducing a Topic		
3) Rhyming Words		
4) Word Association		
5) Going To		
6) What Will Happen		
UNIT II		(18 Hours)
7) Every Drop Counts		
8) Prefix		
9) Suffix		
10) Comprehending Characters		
11) Complimenting & Thanking		
12) Proper & Common Nouns		
UNIT III		(18 Hours)
13) Noun Substitution Table		
14) A, Some		
15) Visual Comprehension		
16) Singular to Plural		
17) Making & Responding		
18) Pronoun Classification		
UNIT IV		(18 Hours)
19) Pronoun I, Me, He, Him, She, Her, We.		
20) Singular to Plural		
21) Responding		
22) Pronoun Classification		
23) Using Preposition of Movement		
24) Preposition: Visual Talk		
UNIT V		(18 Hours)
25) Prepositional Phrases		
26) Storytelling		
27) Asking For Opinion		
28) Using Things Creatively		
29) Transition Sequencing		
30) Role Play		

Book for Study

- Joy, J. L. (2020). *Learning to Communicate*. St. Joseph's College (Autonomous), Tiruchirappalli.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	demonstrate proficiency in paragraph construction, rhyming words, and the use of prefixes and suffixes.	K1
CO2	apply advanced grammar rules, including proper/common nouns and pronoun usage, in both written and spoken communication.	K2
CO3	express opinions, compliments, and gratitude effectively, showcasing an enhanced ability to articulate thoughts and emotions.	K3

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
1	23UEN14AE01	Ability Enhancement Compulsory Course - 1: Communicative English									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	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	
Mean Overall Score											2.37 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23UEN14AE01	Ability Enhancement Compulsory Course - 1: Communicative English	6	3

Course Objectives

- To recognize and demonstrate basic self-introduction strategies.
- To summarize information from listening and reading exercises, demonstrating understanding.
- To apply learned concepts to construct essays, actively contribute to group discussions, and create coherent narratives.
- To analyze reviews to understand how different elements contribute to a comprehensive evaluation.
- To synthesize information to create compelling presentations, actively participate in debates, interviews, and assess their own communication proficiency.

Advance Level

- UNIT I** (18 Hours)
- 1) Self Introduction
 - 2) Listening
 - 3) Reading
- UNIT II** (18 Hours)
- 4) Essay Writing
 - 5) Group Discussion
 - 6) Story Building, Story Writing & Story Narration
- UNIT III** (18 Hours)
- 7) Book Review
 - 8) Film Review
- UNIT IV** (18 Hours)
- 9) News Paper Reading and Analysis
 - 10) Public speaking: Drafting and Speaking
- UNIT V** (18 Hours)
- 11) Debate
 - 12) Interview Skills

Websites and eLearning Resources

1. <https://ielts-up.com/listening/ielts-listening-practice.html>
2. <https://www.bestmytest.com/ielts/speaking>
3. <https://ielts-up.com/speaking/ielts-speaking-practice.html>
4. <https://learnenglishteens.britishcouncil.org/skills/writing/a2-writing/film-review>

Course Outcomes

CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	exhibit high-level language skills in self-introduction, listening, reading, and diverse writing tasks such as essay writing and storytelling.	K1
CO2	critically evaluate and analyze literature through book reviews, film reviews, and newspaper reading, demonstrating an ability to articulate informed opinions.	K2
CO3	showcase proficiency in public speaking, group discussions, debates, and interviews, reflecting a comprehensive mastery of advanced communication skills.	K3

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
1	23UEN14AE01	Ability Enhancement Compulsory Course - 1: Communicative English								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	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
Mean Overall Score											2.37 (High)

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UTA21GL02	General Tamil - 2	4	3

கற்றலின் நோக்கங்கள்				
தமிழ் இலக்கிய வரலாற்றை அறிதல்.				
எழுத்து, சொல் இலக்கணங்களின் அடிப்படைகளைக் கண்டறிதல்.				
அயலகக் கவிதை வடிவங்களை விளங்கிக் கொள்ளுதல்.				
மொழிபெயர்ப்புக் கவிதைகளின் வாயிலாக மொழிபெயர்ப்புத் திறனை வளர்த்தெடுத்தல்.				
போட்டித் தேர்வுகளை எதிர்கொள்வதற்கான இலக்கண அறிவு பெறுதல்.				

அலகு - 1 (12 மணிநேரம்)

பாரதியார் கவிதைகள் - குயில்பாட்டு (குயில் தன் பூர்வ ஜென்மக் கதை உரைத்தல்)
பாரதிதாசன் கவிதைகள் - சஞ்சீவி பர்வத்தின் சாரல்
நற்றமிழ்க்கோவை - முதல் மூன்று கட்டுரைகள்

அலகு - 2 (12 மணிநேரம்)

வெ.இராமலிங்கனார் - சொல், தமிழன் இதயம்
முடியரசனார் - உயிர் வெல்லமோ, மனத்தாய்மை
பெருஞ்சித்திரனார் - அஞ்சாதீர், மொழி, இனம், நாடு
பட்டுக்கோட்டை கலியாண சுந்தரனார் - வருங்காலம் உண்டு, உழைக்காமல் சேர்க்கும் பணம்
இலக்கணம் - எழுத்து
இலக்கிய வரலாறு - புதுக்கவிதை, தமிழில் புதிய கவிதை வடிவங்கள்

அலகு-3 (12 மணி நேரம்)

சுரதா - நல்ல தீர்ப்பு
கண்ணதாசன் - ஒரு பாணையின் கதை
அப்துல் ரகுமான்- வீடு
மேத்தா - ஒரேகுரல்
இலக்கிய வரலாறு - தமிழ்ச்சிறுகதைகள், இருபதாம் நூற்றாண்டு உரைநடை வளர்ச்சி
சிறுகதை - முதல் மூன்று சிறுகதைகள்

அலகு - 4 (12 மணிநேரம்)

அரசியல் கவிதைகள்
ஈரோடு தமிழன்பன்- அகல் விளக்காக இரு
ஆதவன் தீட்சண்யா- இன்னும் இருக்கும் சுவர்களின் பொருட்டு
சுகிர்தராணி- என் கண்மணியே இசைப்பிரியா
சக்தி ஜோதி - யுகாந்திர உறக்கம்
பழநி பாரதி- வெள்ளைக்காகிதம்
லிவிங்ஸ்மைல் வித்யா - நினைவில் பால்யம் அழுத்தம்
இலக்கணம் - சொல்

அலகு - 5 (12 மணிநேரம்)

அயலகக் கவிதைகள்
ஓசேரிசால் (தமிழில் நெய்தல்)- விடைகொடு எந்தாய் மண்ணே
ஹைபுன் கவிதைகள்
சிறுகதை - நான்கு முதல் ஆறு சிறுகதைகள்
நற்றமிழ்க் கோவை - நான்கு முதல் ஆறு கட்டுரைகள்

கற்பித்தல் முறை (Teaching Methodology)	விரிவுரை (Lecture), காணொளிக் காட்சி (Videos), விளக்கக் காட்சி (PPT presentation)
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பாடநூல்கள்

1. தமிழாய்வுத்துறை (2023). பொதுத்தமிழ் -2, தூய வளனார் தன்னாட்சிக் கல்லூரி.

2. தமிழாய்வுத்துறை (2021). நற்றமிழ்க் கோவை, தூய வளனார் தன்னாட்சிக் கல்லூரி.

Websites and eLearning Sources

1. <https://www.chennaiLibrary.com/bharathiyar/kuyilpattu.html>
2. www.tamildigitallibrary.in
3. <https://eluthu.com/kavithai>
4. https://podhutamizh.blogspot.com/2017/09/blog-post_42.html
5. <https://thamizhsudar.com>
6. <https://ta.wikipedia.org/wiki>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
CO1	தமிழ் இலக்கிய நூல்கள் பற்றிய அறிவைப் பெறுவர்.	K1
CO2	தமிழ் இலக்கண வளர்ச்சியைப் புரிந்து கொள்வர்.	K2
CO3	பிழையின்றி எழுதும் திறன் பெறுவதோடு சுற்றல் திறனையும் வளர்த்துக்கொள்வர்.	K3
CO4	பிற கவிதை வடிவங்களைக் கையாளும் திறன் பெறுவர்.	K4
CO5	போட்டித் தேர்வுகளை எதிர்கொள்ளும் திறனைப் பெறுவர்.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
2	23UTA21GL02	General Tamil - 2									4	3
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO2	PSO3	PSO4	PSO5		
CO1	2	1	2	2	3	3	3	2	3	2	2.3	
CO2	2	1	2	2	2	3	2	2	2	2	2.0	
CO3	2	1	2	2	3	3	3	2	3	2	2.3	
CO4	1	2	1	2	2	3	2	2	3	2	2.0	
CO5	1	1	2	2	3	3	3	2	3	2	2.2	
Mean Overall Score											2.16 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UFR21GL02	French - 2	4	3

Course Objectives

- | |
|--|
| To construct simple phrases with pronominal verbs |
| To apply the different types of articles |
| To understand the usage of pronouns |
| To analyse the French culture through French culinary art |
| To evaluate and compare the French fashion in current scenario |

UNIT I (12 Hours)

- TITRE: Les Loisirs
- GRAMMAIRE : les adjectifs interrogatifs, les nombres ordinaux, les verbes pronominaux
- LEXIQUE : les différentes activités quotidiennes, les loisirs, les activités quotidiennes, les matières
- PRODUCTION ORALE : parler sur votre passe-temps
- PRODUCTION ECRITE : décrire sa journée

UNIT II (12 Hours)

- TITRE: La routine
- GRAMMAIRE : les pronoms personnels COD, les verbes du premier groupe en e/er/eler/eter, le verbe prendre
- LEXIQUE : exprimer ses goûts et ses préférences, le temps, l'heure, la fréquence
- PRODUCTION ORALE : savoir comment dire l'heure
- PRODUCTION ECRITE : écrire vos préférences en quelques lignes

UNIT III (12 Hours)

- TITRE: Où Faire Ses Courses?
- GRAMMAIRE : les articles partitifs, le pronom en (la quantité), très ou beaucoup
- LEXIQUE : inviter et répondre à une invitation, les commerces et les commerçants, demander et dire le prix, les quantités
- PRODUCTION ORALE : faire des courses pour une soirée
- PRODUCTION ECRITE : écrire un message en acceptant l'invitation

UNIT IV (12 Hours)

- TITRE: Découvrez et Dégustez
- GRAMMAIRE : l'impératif, il faut, les verbes devoir, pouvoir, savoir, vouloir
- LEXIQUE : Commander et commenter sur un plat de la carte, les aliments, les services, les moyens de paiement
- PRODUCTION ORALE : Jeu de rôle – au restaurant (entre vous et le garçon)
- PRODUCTION ECRITE : faire une comparaison avec la carte française et indienne

UNIT V (12 Hours)

- TITRE: Tout le monde s'amuse/ les ados au quotidien
- GRAMMAIRE : les adjectifs démonstratifs, le pronom indéfini on, le futur proche, le passé composé, les verbes en –yer, voir et sortir
- LEXIQUE : connaître les marques connues sur les vêtements, les sorties, situer dans le temps, les vêtements et les accessoires

- PRODUCTION ORALE : décrire une tenue
- PRODUCTION ECRITE : écrire une lettre amicale, une carte postale

Teaching Methodology	Chalk and talk, visual cues like flashcards, one to one conversation
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Book for Study

1. Dauda, P., Giachino, L. & Baracco, C. (2016). *Generation A1*. Didier.

Books for Reference

1. Girardet, J. & Pecheur, J. (2017). *Echo A1*. CLE International, (2nd Ed.).
2. Mérieux, R. & Loiseau, Y. (2012). *Latitudes A1*. Didier.
3. Fournier, I. (2011). *Talk French*. Goyal Publishers.

Websites and eLearning Sources

1. <https://www.frenchtoday.com/blog/french-verb-conjugation/french-reflexive-verbs-list-exercises/>
2. <https://www.fluentu.com/blog/french/french-subject-pronouns/>
3. <https://grammarist.com/french/french-partitive-article/>
4. <https://www.talkinfrench.com/guide-french-food-habits/>
5. <https://www.fluentu.com/blog/french/talking-about-clothes-in-french/>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	relate pronominal verbs in expressing one's day today activity	K1
CO2	compare the different types of articles – article partitif and contracte	K2
CO3	construct texts using pronouns – passages and dialogues	K3
CO4	discover the food habits of the French culture	K4
CO5	appraise the French fashion	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
2	23UFR21GL02	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	3	3	3	3	1	3	1	2	2	2	2.2	
CO2	2	1	2	3	2	3	1	2	2	2	2.0	
CO3	3	2	3	2	2	3	3	1	3	2	2.4	
CO4	3	2	2	1	3	3	3	1	1	3	2.2	
CO5	2	1	2	2	3	3	3	2	2	2	2.2	
Mean Overall Score											2.2 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UHI21GL02	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)

- Kafan
- Letter Writing - Chutti Patra
- Bakthikal - Namakarn
- Sarkari Kariyalayom Ka Naam

UNIT II (12 Hours)

- Baathcheeth - Dookan Mein
- Kriya
- Letter Writing - Rishthedarom Ko Patra
- Bakthikal - Samajik Paristhithiyam

UNIT III (12 Hours)

- Vah Thodthi Patthar
- Adverb
- Letter Writing - Naukari Keliye Avedan Patra
- Bakthikal - Sahithyik Paristhithiyam

UNIT IV (12 Hours)

- Mukthi
- Samas
- Letter Writing - Kitab Maangne Keliye Patra
- Bakthikal - Salient Features, Main Divisions

UNIT V (12 Hours)

- Anuvad
- Sandhi
- Letter Writing - Nagarpalika Ko Patra
- Bakthikal - Visheshathayem

Teaching Methodology	Peer Instruction Exercise, Videos, PPT, Quiz, Group Discussion
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Books for Study

1. Viswanath Tripaty. (2018). *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd.
2. Kamathaprasad Gupth, M. (2020). *Hindi Vyakaran*. Anand Prakashan.
3. Sadananth Bosalae. (2020). *kavya sarang*, Rajkamal Prakashan.

Books for Reference

1. Acharya Ramchandra Shukla. (2021). *Hindi Sahitya Ka Itihas*. Prabhat Prakashan.
2. Krishnakumar, G. (2016). *Anuvad vigyan ki Bhumika*. Rajkamal Prakashan.
3. Aravind Kumar. (2019). *Sampoorna Hindi Vyakaran our Rachana*, Lucent publisher.
4. Lakshman Prasad Singh. (2017). *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://via hindi.in/hindi-vyakaran/sandhi-paribhasha-prakar-or-udaharan>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of the course, the student will be able to	
CO1	find out the Terms & Expressions related to letter writing.	K1
CO2	explain the works of Hindi writers.	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 the following authors "Premchand, Nirala, etc."	K5

Relationship Matrix											
Semester	Course Code	Title of the Course					Hours	Credits			
2	23UHI21GL02	Hindi - 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	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	23USA21GL02	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) sarvanaam asabdaha

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
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Books for Study

1. Saralasangraha Skisha. (2021).
2. Dhaatu Manjari. (2021).

Books for Reference

1. Paindrapuram Ashram, Srirangam. (2019).
2. Vadhyar, R. S., & Sons, Book - Seller and Publishers. (2021).
3. Kulapthy, K. M. (2018). *Saral Sanskrit Balabodh*. Bharathiys Vidya Bhavan.

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 - Level)
	On successful completion of this course, students will be able to	
CO1	remembering names of different objects, remembering different verbal forms and sandhi	K1
CO2	contrast different verbal forms Explain good sayings, Relate good saying to life.	K2
CO3	apply and build small sentences	K3
CO4	analyze different forms of Verbs and nouns	K4
CO5	appreciate subhashitas and Sanskrit poetry	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
2	23USA21GL02	Sanskrit - 2									4	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	1	3	2	2	2	3	3	2	1	2.1	
CO2	3	2	3	2	2	3	2	3	3	2	2.5	
CO3	2	2	3	2	2	2	2	3	3	1	2.1	
CO4	3	2	3	3	1	2	3	3	3	1	2.4	
CO5	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	23UEN22GE02	General English - 2	5	3

Course Objectives

To develop an expanded and specialised vocabulary related to diverse themes such as education, entertainment, career, and society through activities like word grids, reading, and discussions.
To enhance problem-solving abilities through activities like debates, role-playing, and scenario analysis.
To enable students to express ideas with precision and clarity by practising different forms of expressing quality, comparison, and actions in various contexts.
To equip students with language skills relevant to professional settings.
To encourage students to explore language as a tool for creative expression and communication.

UNIT I

(15 Hours)

01. Education Word Grid
02. Reading Problems and Solutions
03. Syllabification
04. Forms for Expressing Quality
05. Expressing Comparison
06. Monosyllabic Comparison
07. Di/polysyllabic Comparison
08. The Best Monosyllabic Comparison
09. The Best Di/Polysyllabic Comparison
10. Practising Quality Words

UNIT II

(15 Hours)

11. Wh Words
12. Yes/No Recollection
13. Unscramble Wh Questions
14. Wh Practice
15. Education and the Poor
16. Controlled Role Play
17. Debate on Education
18. Education in the Future
19. Entertainment Word Grid
20. Classify Entertainment Wordlist
21. Guess the Missing Letter
22. Proverb-Visual Description
23. Supply Wh Words
24. Rearrange Questions
25. Information Gap Questions

UNIT III

(15 Hours)

26. Asking Questions
27. More about Actions
28. More about Actions and Uses
29. Crime Puzzle
30. Possessive Quiz
31. Humorous News Report
32. Debate on Media and Politics
33. Best Entertainment Source

UNIT IV

(15 Hours)

34. Career Word Grid
35. Job-Related Wordlist
36. Who's Who?
37. People at Work
38. Humour at Workplace
39. Profession in Context
40. Functions and Expressions
41. Transition Fill-in
42. Transition Word Selection
43. Professional Qualities
44. Job Procedures
45. Preparing a Resume
46. Interview Questions
47. Job Cover Letter Format
49. Emailing an Application
50. Mock Interview

UNIT V

(15 Hours)

51. Society Word Grid
52. Classify Society Wordlist
53. Rearrange the Story
54. Storytelling
55. Story Cluster
56. Words Denoting Time
57. Expressing Time
58. What Can You Buy?
59. Noise Pollution
60. Positive News Headlines
61. Negative News Headlines
62. Matching Conditions
63. What Would You Do?
64. If I were the Prime Minister
65. My Dream Country

Teaching Methodology	Lecture Method, Use of ICT Tools and Interactive method
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Book for Study

1. Joy, J.L. & Peter, F.M. (2014). *Let's Communicate 2*, Trinity Press.

Books for Reference

1. Ahrens, Sönke. (2017). *How to Take Smart Notes: One Simple Technique to Boost Writing, Learning and Thinking*. Create Space.
2. Aspinall, Tricia. (2002). *Test Your Listening*. Pearson.
3. Bailey, Stephen. (2004). *Academic Writing: A Practical Guide for Students*. Routledge.
4. Fitikides, T.J. (2002). *Common Mistakes in English*, (6th Ed.). Longman
5. Wainwright., Gordon. (2007). *How to Read Faster and Recall More: Learn the Art of Speed Reading with Maximum Recall*, (3rd Ed.). How to Books.

Websites and eLearning Sources

1. <https://learnenglish.britishcouncil.org/>
2. <https://oneminuteenglish.org/en/best-websites-learn-english/>
3. <https://www.dailywritingtips.com/best-websites-to-learn-english/>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	write paragraphs with apt punctuation marks	K1
CO2	discuss basic issues with friends, relatives and members of the family	K2
CO3	use polite expressions in appropriate ways	K3
CO4	evaluate the language and communication aspects of the topics	K4
CO5	create and produce various forms of communication, including professional documents like resumes and cover letters, debates	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
2	23UEN22GE02	General English - 2									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	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
2	23UCH23CC02	Core Course - 2: General Chemistry - 2	5	4

Course Objectives

To understand the preparation and reactions of alkenes
To learn the characteristic structural features and reactivity of dienes and alkynes
To comprehend the properties of elements and compounds of group I
To comprehend the properties of elements and compounds of group II
To learn the fundamentals of chemical equilibrium and thermodynamics

UNIT I: Alkenes (15 Hours)

Nomenclature - geometrical isomerism - *cis/trans* - *E/Z* - 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, E1cB) - Hoffman elimination and its regioselectivity.

Electrophilic addition - general mechanism - addition of HX - regioselectivity - Markovnikov's and anti-Markovnikov's rules - carbocation stability - addition of bromine and its stereochemistry - halohydrin formation - addition of water (oxymmercuration - demercuration, hydroboration - oxidation) - hydroxylation (*syn*- and *anti*-dihydroxylation) - addition of hydrogen- relative stability of alkenes - ozonolysis.

UNIT II: Dienes and Alkynes (15 Hours)

Dienes: Types- preparation of conjugated dienes - MO of conjugated diene - 1,2/1,4- addition of HX to conjugated dienes - Diels-Alder reaction - its regio- and stereoselectivity - electrocyclic ring closing and opening reactions - Woodward-Hoffman rules - sigmatropic rearrangements: Cope, Claisen and related rearrangements - ozonolysis of dienes - Addition of HX to allenes.

Alkynes: Preparation of alkynes - reductions of alkynes - *syn*- and *anti*-addition to alkenes - acidity of terminal alkynes - electrophilic addition to alkynes - ozonolysis of alkynes

UNIT III: Chemistry of Group 1 Elements (15 Hours)

Differences between lithium and other group 1 elements - general characteristics - sizes of atoms and ions, density, ionization energy, electronegativity and bond type, hardness, melting and boiling points, flame colours and spectra - chemical properties - reaction with water, air and dinitrogen - oxides, hydroxides, peroxides and superoxides- solutions of metals in liquid ammonia - complexes, crowns, crypts and their biological importance.

UNIT IV: Chemistry of Group 2 Elements (15 Hours)

Differences between beryllium and other group 2 elements - general characteristics - sizes of atoms and ions - ionization energy - electronegativity - hydration energies - anomalous behaviour of beryllium - solubility and lattice energy - solutions of metals in liquid ammonia - chemical properties - hardness of water - structures and importance 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+} .

UNIT V: Thermodynamics-I (15 Hours)

Internal energy, work, heat, and energy - definitions- molecular interpretation of heat and work - molecular interpretation of internal energy - formulation of the First Law - expansion work - general expression for work - expansion against constant pressure - reversible expansion - isothermal reversible expansion - heat transactions - calorimetry - heat capacity - 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 μ_{JT}

and other thermodynamic quantities - calculation of Joule -Thomson coefficient for ideal and real gases
 - inversion temperature- zeroth law of thermodynamics - absolute scale of temperature.

Teaching Methodology	Chalk and Talk, PPT, Videos
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Books for Study

1. Bruice, P.Y. (2011) *Organic Chemistry* (8th Ed.), Pearson Ltd., University of California, Santa Barbara.
Unit - I Chapters 5 and 6 Unit- II Chapters 7 and 8, 28
2. Lee, J. D. (1996) *Concise Inorganic Chemistry* (5th Ed.), Blackwell Science Ltd, Oxford, London.
Unit - III Chapter 9 Unit-IV Chapter 11
3. Atkins, P. W. (2018) *Physical Chemistry* (10th Ed.), Oxford University Press.
Unit-V Chapter 2

Books for References

1. Morrison, R. T., & Boyd, R. T. (2011). *Organic Chemistry*, (7th Ed.), Allyn and Bacon Ltd., New York.
2. Solomons, G. T.W. (1996). *Organic Chemistry*, (6th Ed.), John Wiley and Sons, New York.
3. Wade, L. G. (2003). *Organic Chemistry* (5th Ed.), Pearson Ltd., University of California, Santa.
4. Miessler, G.L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry* (5th Ed.), Pearson Education, New York.
5. Housecroft, C. E., & Sharpe, A.G. (2012). *Inorganic Chemistry*, (4th Ed.), Pearson Education, New York.
6. Castellan, G. W. (2004). *Physical Chemistry*, (4th Ed.), Narosa.
7. McQuarrie, D.A., & Simon, J.D. (2004). *Molecular Thermodynamics*, University Science Books, California.
8. Shriver, D., Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2014). *Inorganic Chemistry* (6th Ed.). W H Freeman and Company, New York.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	understand chemistry of unsaturated hydrocarbons, s-block elements, and fundamentals of thermodynamics.	K1
CO2	comprehend the preparations and their characteristic reactions of unsaturated hydrocarbons, compounds of s-block elements and derive the fundamental processes and energy terms used in thermodynamics.	K2
CO3	examine the reactivity, orientation, and stereochemistry of the reaction mechanisms of unsaturated hydrocarbons; structure and bonding in compounds of s-block elements.	K3
CO4	predict the stereochemistry of the products; physical and chemical nature of compounds; and feasibility of chemical processes	K4
CO5	determine the properties of compounds s-block elements; and calculate the energetics involved in chemical systems.	K5

Relationship Matrix											
Semester	Course Code		Title of the Course						Hours	Credits	
2	23UCH23CC02		Core Course - 2: General 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	2	2	1	1	2	3	3	2	2.0
CO2	2	3	3	1	2	1	2	3	2	1	2.0
CO3	3	3	2	3	2	2	2	2	2	1	2.2
CO4	2	2	2	2	2	2	2	2	2	2	2.0
CO5	1	2	1	3	1	2	1	2	3	3	1.9
Mean Overall Score										2.02 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UCH23CP02	Core Practical - 2: Qualitative Analysis	6	4

Course Objectives

To learn the lab safety and identify nature of chemicals
To learn the techniques of semi micro qualitative analysis of inorganic salt mixtures
To learn and eliminate interfering acid radicals
To learn and separate the basic 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 equipments like Bunsen burner, centrifuge, 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
- Nitrate

Analysis of interfering acid radicals:

- Oxalate
- Borate
- Phosphate
- Chromate
- Fluoride

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

Elimination of interfering acid radicals

- Oxalate
- Borate
- Phosphate
- Chromate
- Fluoride

Identifying the groups of basic radicals

Group I : Pb^{2+}

Group II : IIA- $\text{Cu}^{2+}, \text{Cd}^{2+}, \text{Pb}^{2+}, \text{Bi}^{3+}$ and IIB - $\text{Sn}^{2+}, \text{Sn}^{4+}$

Group III: $\text{Fe}^{2+}, \text{Al}^{3+}, \text{Cr}^{3+}$

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

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

Group VI: $\text{Mg}^{2+}, \text{NH}_4^+$

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

Analysis of basic radicals (group-wise): Lead, Copper, Bismuth, Cadmium, Antimony, 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)(max. 15 Mixtures).

Books for Study

1. Svehla, G. (2012). *Vogel's Qualitative Analysis*, (7th Ed.). Pearson Education, India.
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.). New Delhi, Sultan Chand and Sons.

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/>



Systematic Qualitative Analysis



Qualitative Analysis of Inorganic Salts



Handling of Chemicals

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, 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	23UCH23CP02		Core Practical - 2: Qualitative Analysis							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	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										2.26 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UCH23AC02	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
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Books for Study

- Narayanan, S., & Hanumanth, R., Pillay, T.K.M., & Kandaswamy, P. (2009). *Ancillary Mathematics, 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.
- 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

- 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	23UCH23AC02	Allied Course - 2: Mathematics for Chemistry - 2									6	4
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	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	23UHE24VE02	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, January 2012- Human Rights Organizations - NHRC - SHRC.

Teaching Methodology	Chalk and Talk, Power point, Handouts and Group discussion
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Book 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	23UHE24VE02		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)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UHE24AE01	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 - Scope and Importance - Subsystems of Earth - Various recycling Methods - Environmental Movements in India - Eco- Feminism - Public awareness - Suggestions to conserve environment

UNIT II: Natural Resources (6 Hours)

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

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

General structure of ecosystem - Functions of Ecosystem - Energy flow and Ecological pyramids - Levels of Biodiversity - 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 - Issues deals with Population growth.

Teaching Methodology	Chalk and Talk, Power point and Field visit
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Book for Study

1. 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	23UHE24AE01	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
3	23UTA31GL03	General Tamil - 3	4	3

கற்றலின் நோக்கங்கள்				
தனிப்பாடல்களின் பாடற்பொருளை அறிதல்				
சிற்றிலக்கியங்களின் வகைகளையும் வகைமைகளையும் அறிதல்				
இடைக்காலப் புலவர்களின் பங்களிப்பை உணர்தல்				
சிற்றிலக்கியங்களின் பாடுபொருள், தனித்தன்மை, மரபு ஆகியவற்றை அறிதல்				
சிற்றிலக்கியங்கள்வழி தமிழின் வளர்ச்சி நிலையை அறிதல்				

அலகு - 1

(12 மணி நேரம்)

ஒளவையார்

காவிரியே தார்வேந்தன் (16) கற்றது கைமண்ணளவு (39) மதியாதார் முற்றம் (42)

இனியது கேட்கின் (55) தாயொடு அறுசுவை (64)

காளமேகப் புலவர் -

நஞ்சிருக்குத் தோலுரிக்கு நாதர்முடி(4) ஒடுஞ் சூழிசுத்த முண்டமாகும் (16)

அடிநந்தி சேர்தலால் ஆகம் (22) செருப்புக்கு வீரரைச் சென்றுழக்கும் (52)

துதிவாணி வீரம் (80)

இராமச்சந்திர கவிராயர் - வஞ்சகர்பா னடந்தலைந்த - 19

பொற்களந்தைப் படிக்காகத் தம்பிரான் - குட்டுதற்கோபிள்ளைப் பாண்டிய - 21

தமிழ்விடுதாது,- கண்ணிகள் 19 முதல் 62 வரை

கலிங்கத்துப்பரணி - தேவியைப் பரவியது, பாடல் 121 முதல் 134 வரை

அலகு - 2

(12 மணி நேரம்)

முகூடற்பள்ளு - நாட்டுப்படலம் பாடல்கள் 19 - முதல் 27 வரை

முத்துகுமாரசாமி பிள்ளைத்தமிழ் - அம்புலிப்பருவம் முதல் 5 பாடல்கள்

அறிஞர் அண்ணா - வேலைக்காரி நாடகம்

அலகு - 3

(12 மணி நேரம்)

திருக்குறறாலக்குறவஞ்சி - மலைவளம் (6 பாடல்கள்)

இலக்கியவரலாறு - சிற்றிலக்கியங்கள்

நற்றமிழ்க்கோவை கட்டுரைகள் 7, 8, 9

அலகு - 4

(12 மணி நேரம்)

தாயுமானவர் திருப்பாடல்கள் - பராபரக்கண்ணி 7 முதல் 30 வரை உள்ள கண்ணிகள்

இலக்கணம் - அணிகள்

குணங்குடி மஸ்தான் சாகிபு - குறை இரங்கி உரைத்தல் - 7 பாடல்கள்

அலகு - 5

(12 மணி நேரம்)

திருவருட்பா - திருக்கதவம் திறத்தல்

இலக்கிய வரலாறு - இடைக்காலப் புலவர்கள், நாடகத்தமிழ்

நற்றமிழ்க்கோவை - கட்டுரைகள் - 10, 11, 12

கற்பித்தல் முறை	விரிவுரை (Lecture), காணொளிக் காட்சி (Videos), விளக்கக் காட்சி (PPT presentation)
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பாட நூல்கள்

1. தமிழாய்வுத்துறை (2023), பொதுத்தமிழ்-3, தூய வளனார் கல்லூரி
2. தமிழாய்வுத்துறை (2021), நற்றமிழ்க்கோவை, தூய வளனார் கல்லூரி

பார்வை நூல்கள்

1. செயராமன் ந. வீ. (1967), சிற்றிலக்கியச் செல்வம், மணிவாசகர் பதிப்பகம்
2. பொன்னுசாமி (2023), சிற்றிலக்கிய வரலாறு, இரண்டு தொகுதிகள், பாரிநிலையம்
3. சண்முகம் பிள்ளை மு. (2022), சிற்றிலக்கிய வகைகள், மணிவாசகர் பதிப்பகம்

Websites and eLearning Sources

1. <https://ta.wikipedia.org/wiki/>
2. <https://www.britannica.com/science/Siddha-medicine>

3. <https://nischennai.org/main/siddha-medicine/>
4. <https://tamil.hindustantimes.com/>
5. <https://www.tamiluniversity.ac.in/english/library2-/digital-library/>
6. <https://www.tamilelibrary.org/>
7. www.projectmadurai.or
8. <http://www.tamilvu.org/ta/library-libcontnt-273141>
9. <https://www.tamildigitallibrary.in/>
10. <https://noolaham.org/>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
CO1	இடைக்காலப் புலவர்களின் பாட்டுத்திறனை அறிந்து கொள்வர்	K1
CO2	சிற்நிலக்கிய வகைகளையும் வகைமைகளையும் அறிந்து கொள்வர்	K2
CO3	பள்ளு, பரணி, பிள்ளைத்தமிழ், குறவஞ்சி போன்ற இலக்கியங்கள் வழி வீரம், பக்தி, காதல் உணர்வை அறிந்து கொள்வர்	K3
CO4	சிற்நிலக்கியங்களின் அமைப்பு பாட்டு வடிவங்களை அறிந்து கொள்வர்	K4
CO5	இடைக்காலத் தமிழ் வளர்ச்சி நிலையை அறிந்து கொள்வர்	K5

Relationship Matrix												
Semester	Course Code		Title of the Course								Hours	Credits
3	23UTA31GL03		General Tamil - 3								4	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	3	2	2	3	2	3	2	3	3	2	2.5	
CO2	2	2	2	3	3	2	2	3	3	2	2.4	
CO3	3	3	2	3	3	2	2	3	3	3	2.7	
CO4	3	2	2	3	2	3	2	3	2	3	2.5	
CO5	2	3	2	3	2	3	2	3	2	3	2.5	
Mean Overall Score											2.52 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UFR31GL03	French - 3	4	3

Course Objectives

To analyse the French clothing with respect to its culture
To apply prepositions and understand its usages
To analyse a contemporary text in present tense
To evaluate the French festivals and compare with their own cultural context
To apply the past tense using simple conversation

UNIT I (12 Hours)

- TITRE: Vivre la ville
- GRAMMAIRE : la comparaison, les prépositions avec les noms géographiques, les pronoms personnels COI, le pronom y (le lieu)
- LEXIQUE : se repérer sur un plan de ville, la ville, les lieux de la ville
- PRODUCTION ORALE : demander et indiquer une direction dans un dialogue
- PRODUCTION ECRITE : décrire votre ville natale, créez les affiches en appréciant votre ville

UNIT II (12 Hours)

- TITRE: Visiter une ville
- GRAMMAIRE : la position des pronoms compléments, les verbes du premier groupe en – ger et – cer, les verbes ouvrir et accueillir
- LEXIQUE : dire les informations sur une ville de votre choix, les transports, les points cardinaux, les prépositions de lieu
- PRODUCTION ORALE : Indiquer le chemin
- PRODUCTION ECRITE : Demander des renseignements touristiques

UNIT III (12 Hours)

- TITRE: On vend ou on garde
- GRAMMAIRE : la formation du pluriel, les adjectifs de couleurs, l'adjectif beau, nouveau, vieux
- LEXIQUE : savoir comment s'habiller des grandes occasions, les couleurs, les formes, les matériaux
- PRODUCTION ORALE : comprendre une présentation de catalogues vestimentaires en France
- PRODUCTION ECRITE : adresser des souhaits à quelqu'un

UNIT IV (12 Hours)

- TITRE: Ventes d'autrefois, ventes d'aujourd'hui
- GRAMMAIRE : les pronoms relatifs qui et que, l'imparfait, les verbes connaître, écrire, mettre et vendre, la question avec inversion
- LEXIQUE : comprendre la description de personnes dans un extrait de roman, les mesures, l'informatique
- PRODUCTION ORALE : imaginez un dialogue avec un personnage célèbre. Utilisez l'inversion.
- PRODUCTION ECRITE : écrire une biographie en utilisant les pronoms relatifs

UNIT V**(12 Hours)**

- **TITRE:** Félicitations! / On voyage!
- **GRAMMAIRE :** les pronoms démonstratifs, les articles : particularités, les pronoms interrogatifs variables : lequel, les adverbes de manières, les verbes recevoir et conduire
- **LEXIQUE :** les moyens de transports, les voyages, les fêtes, l'aéroport et l'avion, la gare et le train, l'hôtel
- **PRODUCTION ORALE :** Présenter ses vœux–
- **PRODUCTION ECRITE :** Faire une réservation

Teaching Methodology	PPT Presentation, Seminar, Video Assignments
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Book for Study

1. Dauda, P., Giachino, L., & Baracco, C. (2016). *Generation AI*. Didier.

Books for Reference

1. Girardet, J., & Pecheur, J. (2017). *Echo AI*. (2nd Ed.). CLE International.
2. Mérieux, R., & Loiseau, Y. (2012). *Latitudes AI*. Didier.
3. Fournier, I. (2011). *Talk French*. Goyal Publishers.

Websites and eLearning Sources

1. <https://français.lingolia.com/en/grammar/prepositions>
2. <https://www.lawlessfrench.com/grammar/present-tense/>
3. <https://www.thoughtco.com/textures-french-adjectives-and-expressions-1368980>
4. <https://study.com/academy/lesson/past-tense-in-french.html>
5. <https://absolutely-french.eu/french-celebrations/?lang=en>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	relate colours, materials and shapes to the french clothing.	K1
CO2	select appropriate prepositions in giving directions.	K2
CO3	construct a text in present tense using different verbs.	K3
CO4	examine the travel manners and celebrations of the French.	K4
CO5	justify the usage of past tense in a biography.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
3	23UFR31GL03	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	1	2	2	3	2	3	1	2	3	2.1	
CO2	3	2	3	3	1	2	1	2	2	3	2.2	
CO3	2	1	3	2	2	3	1	3	2	2	2.1	
CO4	3	1	3	2	3	3	3	1	2	3	2.4	
CO5	3	2	3	2	2	3	3	2	2	1	2.3	
Mean Overall Score											2.22 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UHI31GL03	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)

- Tera Sneh Na Khoon
- Samband Bodak
- Reethikal - Namakarn
- Tense

UNIT II (12 Hours)

- Himadri Thung Sring Se
- Paribakshik Shabdavali
- Smuchaya Bodak
- Reethikal - Samajik Paristhithiyam

UNIT III (12 Hours)

- Insan Our Kuthae
- Vismayadi Bodak
- Reethikal - Sahithyik Paristhithiyam
- Reethikal - Salient Features

UNIT IV (12 Hours)

- Shokgeeth
- Avikary Shabdh
- Reethikal - Main Divisions
- Social Media and Modern World

UNIT V (12 Hours)

- Reethikal - Visheshathayem
- Anuvad
- Bahoo Ki Vidha (One Act Play)

Teaching Methodology	Videos, PPT, Quiz, Group Discussion, Case Based Problem Solving
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Books for Study

1. Jain, S.K. (2019). *Anuwad: Siddhant Evam Vyavhar*. Kailash Pustak Sadan.
2. Gupth, K. M. (2020). *Hindi Vyakaran*, Anand Prakashan.
3. Bosalae, S. (2020). *kavya sarang*. Rajkamal Prakashan.

Books for Reference

1. Ramdev. (2016). *Vyakaran Pradeep*. Hindi Bhavan.

2. Singh, L.P. (2017). *Kavya Ke Sopan*. Bharathy Bhavan Prakashan.
3. Shukla, A.R. (2021). *Hindi Sahitya Ka Itihas*, Prabhat Prakashan.
4. Gosamy, K. (2016). *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 able to	
CO1	find out the dialects of Hindi language.	K1
CO2	compare the poems of Sumithra Nandanpanth, Prasad & Bachan in Context with their experience of life.	K2
CO3	illustrate the importance given to family ethics by the youth in the modern period according to “Bahoo Ki vidha” One Act play.	K3
CO4	categorize the poetics in some selective poems.	K4
CO5	justify the social & political conditions of Devotional period in Hindi Literature.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course					Hours	Credits				
3	23UHI31GL03	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	23USA31GL03	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
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Books for Study

1. Vedic literature
2. Ramodantam

Books for Reference

1. Parameshwara. (2018). *Ramodantam*. LIFCO Chennai.
2. Vadhyar, R. S., & Sons. (2019). *History of Sanskrit Literature*, Book - sellers and publishers , Kalpathu ,Palghat, Kerala , south India.
3. Kulapathy, K.M Saral *Sanskrit Balabodh, Bharathita vidya bhavan*, Munshimarg.

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.learn Sanskrit.org/guide/uninflected-words/the-upasarga/>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	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	23USA31GL03	Sanskrit - 3									4	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	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/Week	Credits
3	23UEN32GE03	General English - 3	5	3

Course Objectives

To develop strategies to enhance reading skills through teacher-led practices, promoting comprehension, critical analysis, and creative engagement with various genres.
To strengthen informal and formal letter writing skills.
To analyze and appreciate different literary forms, including anecdotes, biographies, poems, and prose, fostering critical thinking and creative expression.
To practice applying grammatical structures, including the simple future and future continuous tenses, in writing tasks.
To engage in critical discussions through reading and writing about societal issues.

UNIT I: Suggestions to Develop Your Reading Habit (13 Hours)

- 1.0 Introduction
- 1.1 Objectives
- 1.2 Listening and Reading Skills through Teacher-led Reading Practice
- 1.3 Glossary
 - 1.3.1 Words
 - 1.3.2 Phrases
- 1.4 Reading Comprehension
- 1.5 Critical Analysis
- 1.6 Creative Task
- 1.7 General Writing Skill: Letter Writing: Informal
- 1.8 Grammar: Simple Present Tense

UNIT II: The Secret of Success: An Anecdote (13 Hours)

- 1.9 Introduction
- 2.0 Objectives
- 2.1 Listening and Reading Skills through Teacher-led Reading Practice
- 2.2 Glossary
 - 2.3.1 Words
 - 2.3.2 Phrases
- 2.4 Reading Comprehension
- 2.5 Critical Analysis
- 2.6 Creative Task
- 2.7 General Writing Skills: Letter Writing: Formal
- 2.8 Grammar: Present Continuous Tense

UNIT III: The Impact of Liquor Consumption on the Society (13 Hours)

- 2.9 Introduction
- 3.0 Objectives
- 3.1 Listening and Reading Skills through Teacher-led Reading Practice
- 3.2 Glossary
 - 3.3.1 Words
 - 3.3.2 Phrases
- 3.4 Reading Comprehension
- 3.5 Critical Analysis
- 3.6 Creative Task
- 3.7 General Writing Skills: Letter to Newspaper
- 3.8 Grammar: Simple Past Tense

UNIT IV: Dr. A.P.J. Abdul Kalam: A Short Biography**(12 Hours)**

- 3.9 Introduction
- 4.0 Objectives
- 4.1 Listening and Reading Skills through Teacher-led Reading Practice
- 4.2 Glossary
- 4.3.1 Words
- 4.3.2 Phrases
- 4.4 Reading Comprehension
- 4.5 Critical Analysis
- 4.6 Creative Task
- 4.7 General Writing Skill: Write a letter applying for a job
- 4.8 Grammar: Past Continuous Tense

UNIT V: Golden Rule: A Poem**(12 Hours)**

- 4.9 Introduction
- 5.0 Objectives
- 5.1 Listening and Reading Skills through Teacher-led Reading Practice
- 5.2 Glossary
- 5.3.1 Words
- 5.3.2 Phrases
- 5.4 Reading Comprehension
- 5.5 Critical Analysis
- 5.6 Creative Task
- 5.7 Grammar: Simple Future Tense
- 5.8 General Writing Skill: Circular-Writing

UNIT VI: Hygiene**(12 Hours)**

- 5.9 Introduction
- 6.0 Objectives
- 6.1 Listening and Reading Skills through Teacher-led Reading Practice
- 6.2 Glossary
- 6.3.1 Words
- 6.3.2 Phrases
- 6.4 Reading Comprehension
- 6.5 Critical Analysis
- 6.6 Creative Task
- 6.7 General Writing Skill: Writing an Agenda for a Meeting
- 6.8 Grammar: Future Continuous Tense

Teaching Methodology	Lecture Method, Use of ICT Tools and Interactive method
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Book for Study

1. Jayraj., & Arul, S.J. et al. (2016). *Trend-Setter: An Interactive General English Textbook for Undergraduate Students*. Trinity.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On completion of this course, students will be able to	
CO1	recall and explain the fundamental components of English language and grammar.	K1
CO2	demonstrate their understanding of various texts by summarizing, paraphrasing, and interpreting the contents.	K2
CO3	apply their language and comprehension skills to create written communication.	K3
CO4	critically analyze the texts presented in the course.	K4
CO5	synthesize the language and grammar knowledge to compose creative tasks	K5

Relationship Matrix											
Semester	Course Code		Title of the Course					Hours	Credits		
3	23UEN32GE03		General English - 3					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	23UCH33CC03	Core Course - 3: General Chemistry - 3	5	4

Course Objectives

To understand the mechanism of nucleophilic substitution reactions
To explain the mechanism of aromatic electrophilic substitution reactions
To illustrate the synthesis and reactions of polynuclear hydrocarbons
To examine the feasibility of chemical processes based on the thermodynamic criteria
To evaluate the processes of drug action, drug metabolism and drug design

UNIT I: Substitution Reactions of Alkyl halides (15 Hours)

Nucleophilic substitution mechanisms - S_N^2 -Factors affecting S_N^2 reactions: leaving group - nucleophilicity - basicity and nucleophilicity, effects of solvents and steric effect on nucleophilicity - reversibility of S_N^2 reactions -mechanism of S_N^1 reaction -factors affecting S_N^1 reactions-leaving group - nucleophile - carbocation rearrangement - stereochemistry of S_N2 and S_N1 reactions -Walden inversion - racemization in S_N^1 reactions - reactions of benzylic, allylic, vinylic and aryl halides - competition between S_N^2 and S_N^1 reactions -role of the solvent in S_N^2 and S_N1 reactions - competition between substitution and elimination- $S_N^2/E2$ conditions - $S_N^1/E1$ conditions - substitution and elimination reactions in synthesis - S_N^1 reaction - example and mechanism.

UNIT II: Aromaticity and Polynuclear Compounds (15 Hours)

Criteria for aromaticity - Huckel's rule- aromatic hydrocarbons - cations and anions - annulenes - consequences of aromaticity: pK_a , 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. Naphthalene and Anthracene-Haworth synthesis-Electrophilic substitution reactions-oxidation-reduction.

UNIT III: Alcohols, Phenols and Ethers (15 Hours)

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

UNIT IV: Thermodynamics - II (15 Hours)

The second law of thermodynamics - direction of spontaneous change - dispersal of energy - entropy - thermodynamic definition of entropy - entropy as a state function - Carnot cycle - thermodynamic temperature - 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 - some remarks on the Helmholtz energy - maximum work - some remarks on Gibbs energy - maximum non-expansion work - standard Gibbs energies of reaction - standard Gibbs energies of formation - Born equation - combining first and second laws -Fundamental equation - properties of internal energy - Maxwell relations - variation of internal energy with volume - properties of the Gibbs energy - variation of the Gibbs energy with temperature and pressure.

UNIT V: Pharmaceutical Chemistry (15 Hours)

Drugs - definition- sources- study of drugs -classification (Biological chemical, commercial and utility)- Nomenclature of drugs- Mechanism of drug action and metabolism of drugs-Biotransformation- Drug design - factors affecting the stability of drugs- Encapsulation - drug delivery systems and sustained release of drugs. Side effects of the drugs.

Teaching Methodology	Chalk and Talk, PPT, Videos
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Books for Study

- Bruice, P Y. (2011). *Organic Chemistry*, (8th Ed.). Pearson Ltd. University of California. Santa Barbara.
Unit-I Chapter 10-12
Unit-II Chapter 14 & 15
Unit-III Chapter 6 & 12
Unit-V Chapter 30
- Atkins, P. W., & Paula, J. D. (2018). *Atkins' Physical Chemistry*, (8th Ed.). Oxford University Press. Oxford.
Unit-IV Chapter 3
- Gosh, J. (1997). *Text Book of Pharmaceutical Chemistry*. S. Chand & Chand Publications.
Unit-V Chapter 1, 2 & 3

Books for Reference

- Robert, T. M. & Robert, T. B. (2011). *Organic Chemistry*, (7th Ed.). Allyn and Bacon Ltd.
- Finar, I. L. (1996). *Organic Chemistry*. Vol: 1 and 2, (6th Ed.). Addison Wesley Longman Ltd.
- Soni, P. L., & Chawla, H. M. (2010). *Text Book of organic Chemistry*, (29th Ed.). Sultan Chand & Sons.
- Puri, B. P. & Sharma, L. R. (2018). *Principles of Physical Chemistry*, (47th Ed.). Vishal Publication.
- Castellan, G. W. (2004). *Physical Chemistry*, (4th Ed.). Narosa.
- Mc Quarrie, D. A., & Simon, J. D. (2004). *Molecular Thermodynamics*. University Science Books.

Websites and eLearning Sources

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

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of course, students will be able to	
CO1	understand the preparation and chemical properties of alkyl and aryl halides	K1
CO2	compare and contrast between the different laws of thermodynamics	K2
CO3	describe the preparation and chemical properties of alcohols, phenols and ether	K3
CO4	apply the concepts of thermodynamics to natural and industrial processes	K4
CO5	analyze the classification, pharmacology and pharmacokinetics of drug	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
3	23UCH33CC03	Core Course - 3: General Chemistry - 3									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	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
3	23UCH33CC04	Core Course - 4: General Chemistry - 4	5	4

Course Objectives
To develop a comprehensive understanding of the properties, occurrence, and significance of Group 13 elements.
To develop a fundamental understanding of the properties, structures, and characteristics of Group 14 elements
To examine the chemical reactivity of Group 15 elements, including their ability to form various compounds and the factors influencing their reactivity.
To understand the chemical aspects of metallic mixtures composition and properties through phase diagrams
To explore the ionization and dissociation of acids, bases, and salts in aqueous solutions, including the formation of ions.

UNIT I: Borongroupelements (15 Hours)

Inert-pair effect-general characteristics - melting and boiling points, sizes of atoms and ions, electropositive character, ionization energy-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 and borazine

UNIT II: Carbongroupelements (15 Hours)

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 and halides (stannous chloride).

UNIT III: Nitrogengroupelements (15 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 $\text{H}_4\text{P}_2\text{O}_7$) - preparation, properties and structure of hydrazine - nitrogen and phosphorous fertilizers.

UNIT IV: Phase Equilibria (15 Hours)

Phase rule -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. Phase diagrams of two component systems solid-liquid equilibrium - simple eutectic-thermal analysis - Bi-Cd system - Pb-Ag systems - 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 - three component system (Acetic acid-Chloroform-Water) only.

UNIT V: Ionic Equilibrium (15 Hours)

Ionic equilibrium - 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.

Teaching Methodology	Chalk and Talk, PPT, Videos
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Books for Study

1. Lee, J. D. (2006). *Concise Inorganic Chemistry*, (5th Ed.). Blackwell Science Ltd. Oxford.
2. Atkins, P. W. (2018) *Physical Chemistry*, (10th Ed.). Oxford University Press.

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. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John Wiley and Sons. Inc.
4. Castellan, G. W. (2004). *Physical Chemistry*, (4th Ed.). Narosa.
5. Mc Quarrie, D. A., & Simon, J. D. (2004). *Molecular Thermodynamics*. University Science Books.

Websites and eLearning Sources

1. https://www.chemeurope.com/en/encyclopedia/Boron_trioxide.html
2. <https://www.bbc.co.uk/bitesize/guides/zjfk6f/revision/4>
3. <https://www.turito.com/blog/chemistry/ammonia>
4. <https://qsstudy.com/one-component-phase-systems-water-system/>
5. <https://shiken.ai/chemistry/ionic-product-of-water>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of course, students will be able to	
CO1	understand the nature and periodic properties of p-block elements.	K1
CO2	compare and contrast between the different concepts Carbon family group elements	K2
CO3	identify the important compounds formed by the p-block elements.	K3
CO4	examine the various systems and their coexistence in phase equilibrium.	K4
CO5	check and solve various problems based on chemical equilibrium	K5

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
3	23UCH33CC04	Core Course - 4: General Chemistry - 4								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	3	1	4	2	3	5	2	1	5	2.8
CO2	4	4	5	2	1	3	2	3	1	2	2.7
CO3	1	2	3	2	2	3	2	2	3	4	2.4
CO4	3	3	2	2	1	3	2	3	4	5	2.8
CO5	3	2	3	2	1	3	2	3	4	2	2.5
Mean Overall Score											2.64 (Moderate)

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UCH33CP03	Core Practical - 3: Physical Chemistry -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: Theory of the Practical (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

Books for Study

1. *Lab Manual*. Department of Chemistry. St. Joseph's College (Autonomous).
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. Bing Videos
2. Bing Videos

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
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	23UCH33CP03	Core Practical - 3: Physical Chemistry -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		
CO 1	1	1	2	3	4	2	3	2	3	3	2.4	
CO 2	2	3	4	3	4	2	1	3	4	3	2.9	
CO 3	1	3	1	4	3	2	2	3	3	1	2.3	
CO 4	2	3	2	3	2	2	3	2	1	4	2.4	
CO 5	3	4	3	3	2	2	3	1	2	3	2.6	
Mean Overall Score											2.5 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UCH33AO01A	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	Demo Videos, PPT, Handouts, Study materials
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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/Week	Credits
3	23UCH33AO01A	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	3	3	2	1	3	2	2	1	1	2.1
CO2	3	2	3	3	2	2	3	2	2	1	2.3
CO3	3	2	3	2	2	3	2	2	2	2	2.3
CO4	3	3	2	3	2	3	3	3	2	2	2.6
CO5	3	2	2	3	2	3	2	3	2	2	2.4
Mean Overall Score											2.34 (High)

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UCH33AO01B	Allied Optional - 1: Principles of Electronics	4	3

Course Objectives

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	Chalk and Talk, PPT
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Book 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*.
4. *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 Source

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

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
CO1	On successful completion of this course, the students will be able to 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	23UCH33AO01B	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)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UHE34VE03A	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

Book 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	Credits
3	23UHE34VE03A	Value Education - 3: Social Ethics - 1									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	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	23UHE34VE03B	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:	God of salvation	(6 Hours)
UNIT II:	Life & Mission of Jesus Christ	(6 Hours)
UNIT III:	The Holy Spirit	(6 Hours)
UNIT IV:	Gospel Values	(6 Hours)
UNIT V:	Mary, the Mother of God	(6 Hours)

Teaching Methodology	Chalk and Talk, Power point, Assignment and Group discussion
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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	Credits
3	23UHE34VE03B	Value Education - 3: Religious Doctrine - 1									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	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	23UTA41GL04B	General Tamil - 4: அறிவியல் தமிழ் (Scientific Tamil)	4	3

கற்றலின் நோக்கங்கள்	
அன்றாட வாழ்வில் அறிவியலின் செல்வாக்கை அறிந்துகொள்ளுதல்	
பண்டைத்தமிழர் வாழ்வில் இடம்பெற்ற அறிவியல்சூறுகளைக் கண்டறிதல்	
அறிவியலின் வளர்நிலைகளையும் வகைப்பாடுகளையும் கண்டுணர்தல்	
பண்டைத்தமிழரின் பல்துறைச் சிந்தனைகள்வழி தமிழர் தம் பண்பாட்டு மேன்மையை உணர்தல்	
படைப்பாற்றல் திறனைக் கண்டறிந்து வளர்த்தெடுத்தல்	

அலகு 1

(12 மணி நேரம்)

தொல்காப்பியம்: நிலம் தீ நீர் வளி விசும்போடு (தொல். பொருள் 635)

ஒன்றறிவதுவே (தொல். பொருள் 571)

புறநானூறு

மண் திணித்த நிலனும் (புறம் 2 1- 6) செஞ்ஞா யிற்றுச் செலவும் (புறம் 30 1- 7)

அகநானூறு

அம்ம வாழி, தோழி (அகம் 141: 1-11) செஞ்ஞா யிற்றுச் செலவும் (புறம் 30 1-7)

பதிற்றுப்பத்து

நிலம் நீர் வளி விசும்பு என்ற நான்கின் (பதிற்று 14:1-4)

நெடுவயின் ஒளிறு மின்னுப் பரந்தாங்கு (பதிற்று 24:1-26)

உரைநடைக்கட்டுரை: வியக்க வைக்கும் தமிழரின் அறிவியல்

அலகு 2

(12 மணி நேரம்)

சித்தர் பாடல்கள்

பதார்த்த சிந்தாமணி

குளத்து சலந்தானே கொடிதான (27) ஏரிசலம் வாதமிகு மதுவே (31)

அருவிநீர் மேக மகற்றுங் (39) மேவிய சீவன் வடிவது சொல்லிடில் (திருமூலர்)

அணுவில் அணுவினை ஆதிபிரானை (திருமூலர்)

நட்டகல்லைத் தெய்வமென்று (சிவவாக்கியர்)

உரைநடைக்கட்டுரை: தமிழர்களின் மருத்துவ அறிவியல்

அலகு 3

(12 மணி நேரம்)

திருக்குறள் (2 அதிகாரங்கள்)

வான் சிறப்பு, மருந்து வலைப்பூக்கள் உருவாக்கல், பராமரித்தல் புதிய அறிவியல் கலைச்சொல்லாக்கங்களை உருவாக்குதல்

உரைநடைக்கட்டுரை: தமிழ் இலக்கியங்களில் வெளிப்படும் நீர்

மேலாண்மையியல்

அலகு 4

(12 மணி நேரம்)

புதினம்: சொர்க்கத்தீவு - சுஜாதா நூல் - திறனாய்வு அறிவியல் புனைவு

ஆவணப்படம், திரைப்படம் - திறனாய்வு

உரைநடைக்கட்டுரை: தமிழில் அறிவியல் புனைவுகள்

அலகு 5

(12 மணி நேரம்)

அறிவியல்; கலைச்சொற்கள் அன்றாட வாழ்வில் அறிவியல் பழமொழிகளைத் தொகுத்தல் மூலிகைகள், கீரைகள் ஆகியவற்றின் முக்கியத்துவத்தைக் காட்சிப்படுத்துதல். தமிழர் அறிவியல் கண்காட்சி நடத்துதல்

உரைநடைக்கட்டுரை: அறிவியல் தமிழின் வளர்ச்சி நிலைகள்;

கற்பித்தல் முறை	விரிவுரை (Lecture), காணொளிக் காட்சி (Videos), விளக்கக் காட்சி (PPT presentation)
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பாட நூல்கள்

1. தமிழாய்வுத்துறை (2021), அறிவியல் தமிழ் , தூய வளனார் தன்னாட்சிக் கல்லூரி
2. சுஜாதா (2009), சொர்க்கத்தீவு, லிசா பப்ளிகேஷன்ஸ்,
3. மூர்த்தி அ.கி.(2001) , அறிவியல் கலைச்சொல் அகராதி, மணிவாசகர் பதிப்பகம்.

பார்வை நூல்கள்

1. நெடுஞ்செழியன்(2017), இன்னும் மீதமிருக்கிறது நம்பிக்கை, பூவுலகின் நண்பர்கள் வெளியீடு
2. குழந்தைசாமி.வா.செ., (2001), அறிவியல்தமிழ், பாரதி பதிப்பகம்

Websites and eLearning Sources

1. www.tamilvu.org
2. www.tamildigitallibrary.in
3. https://www.tamiluniversity.ac.in/english/library2-/digital-library/
4. https://www.tamilelibrary.org/

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
CO1	பண்டைய தமிழர்களின், அறிவியல் அறிவை அறிந்து கொள்வர்.	K1
CO2	பண்டைய தமிழ் இலக்கியங்களுள் காணாலும் அறிவியல் சிந்தனைகளைப் புரிந்துகொள்வர்.	K2
CO3	தமிழரின் அறிவியல் மருத்துவத்தையும், நீர் மேலாண்மை அறிவையும் அறிந்து கொள்வர்.	K3
CO4	இக்கால இலக்கியங்களுள் அறிவியல்துறை பெற்றுள்ள இடத்தை அறிந்து கொள்வர்.	K4
CO5	அறிவியல் கலைச்சொற்களைத் தமிழில் கற்றுக் கொண்டு அறிவியல்தமிழ் வளரத் துணைபுரிவர்.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
4	23UTA41GL04B	General Tamil - 4: அறிவியல் தமிழ் (Scientific Tamil)									4	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	1	2	3	2	2	3	3	2	2	2	2.2	
CO2	2	2	3	2	2	2	3	2	3	2	2.3	
CO3	1	2	2	3	2	2	2	3	3	3	2.3	
CO4	2	2	3	2	2	3	2	3	3	2	2.4	
CO5	3	1	2	2	2	2	3	2	3	3	2.3	
Mean Overall Score											2.3 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UFR41GL04	French - 4	4	3

Course Objectives
To analyse the French clothing with respect to its culture
To apply prepositions and understand its usages
To analyse a contemporary text in present tense
To evaluate the French festivals and compare with their own cultural context
To apply the past tense using simple conversation

UNIT I (12 Hours)

- TITRE: On fait le mélange!
- GRAMMAIRE : le présent progressif, les pronoms possessifs, la phrase négative
- LEXIQUE : décrire les étapes d'une action, la maison, les tâches ménagères
- PRODUCTION ORALE : comprendre le récit d'un voyage
- PRODUCTION ECRITE : raconter ses actions quotidiennes

UNIT II (12 Hours)

- TITRE: à propos de logement
- GRAMMAIRE : quelques adjectifs et pronoms indéfinis, les verbes lire, rompre et se plaindre
- LEXIQUE : la localisation et le logement, les pièces, meubles et équipement
- PRODUCTION ORALE : jeu de rôle –votre ami et vous s'installe dans un nouveau meuble
- PRODUCTION ECRITE : décrire votre maison/appartement

UNIT III (12 Hours)

- TITRE: Tous en forme!
- GRAMMAIRE : le passé composé et l'imparfait, le passé récent, l'expression de la durée
- LEXIQUE : un souvenir et les événements du passés, le corps humain : extérieur, le corps humain : intérieur
- PRODUCTION ORALE : échanger sur ses projets de vacances
- PRODUCTION ECRITE : raconter un souvenir

UNIT IV (12 Hours)

- TITRE: Accidents et catastrophes
- GRAMMAIRE : les adjectifs et les pronoms indéfinis : rien/ personne/aucun, les verbes dire, courir et mourir
- LEXIQUE : savoir les mots et les expressions des catastrophes naturelles, les maladies et les remédies, les accidents, les catastrophes naturelles
- PRODUCTION ORALE : comprendre des personnes qui expriment leur accord ou leur désaccord selon un thème donné
- PRODUCTION ECRITE : écrivez sur une catastrophe naturelle en articulant la cause et la conséquence

UNIT V (12 Hours)

- TITRE: Faire ses études a l'étranger/ bon voyage/ la météo
- GRAMMAIRE : les pronoms démonstratifs neutres, le futur simple, situer dans le temps, moi

- aussi/non-plus – moi non/si, les verbes impersonnels, les verbes croire, suivre et pleuvoir
- **LEXIQUE** : savoir vivre en France, le système scolaire, les formalités pour partir à l'étranger, la météo
 - **PRODUCTION ORALE** : exprimer son opinion sur la météo/parler de l'avenir
 - **PRODUCTION ECRITE**: comparer le système scolaire français et indien

Teaching Methodology	Workshop, group activity, Sharing contemporary french cultural videos
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Book for Study

1. Dauda, P., Giachino, L., & Baracco, C. (2016). *Generation AI*. Didier.

Books for Reference

1. Girardet, J., & Pecheur, J. (2017). *Echo AI*. (2nd Ed.). CLE International.
2. Mérieux, R., & Loiseau, Y. (2012). *Latitudes AI*. Didier.
3. Fournier, I. (2011). *Talk French*. Goyal Publishers.

Websites and eLearning Sources

1. <https://www.frenchcourses-paris.com/french-travel-journal/>
2. <http://www.saberfrances.com.ar/vocabulary/house.html>
3. <https://www.thoughtco.com/different-past-tenses-in-french-1368902>
4. <https://www.youtube.com/watch?v=JZdwJM7sEY8>
5. <https://www.scholaro.com/pro/Countries/France/Education-System>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
CO1	recall the vocabulary pertaining to dwelling place.	K1
CO2	outline crisis management in France.	K2
CO3	develop a travel diary of your own.	K3
CO4	simplify the French education system.	K4
CO5	interpret past tenses in a text.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
4	23UFR41GL04	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	3	1	3	2	2	3	2	1	2	2	2.1	
CO2	3	1	2	3	3	3	2	1	3	1	2.2	
CO3	3	2	3	2	2	3	2	1	3	2	2.3	
CO4	3	1	2	2	3	3	3	1	3	3	2.4	
CO5	2	2	3	3	1	3	1	2	3	2	2.2	
Mean Overall Score											2.24 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UHI41GL04	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)

- Computer Ka Yug
- Prathyay
- Adhunik Kal – Namakarn
- Namakaran

UNIT II (12 Hours)

- Vigyan Hani/Labh
- Paryayvachy Shabdh
- Adhunik Kal - Samajik Paristhithiyam
- Samanarthy Shabdh

UNIT III (12 Hours)

- Nari Shiksha
- Upasarg
- Adhunik Kal – Sahithyik Paristhithiyam
- Adhunik Kal – Salient Features

UNIT IV (12 Hours)

- Review- Book/Film
- Paryavaran Pradookshan
- Adhunik Kal - Main Divisions
- Adhunik Kal - Visheshathayem

UNIT V (12 Hours)

- Sapnom Kee Home Delivery (Novel)
- Anuvad

Teaching Methodology	Debate Participation, Videos, PPT, Quiz, Project Work
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Books for Study

1. Bosalae, S. (2020). *kavya sarang*. Rajkamal Prakashan.
2. Gupt, M. K. (2020). *Hindi Vyakaran*. Anand Prakashan.
3. Jain, S.K. (2019). *Anuwad: Siddhant Evam Vyavhar*. Kailash Pustak Sadan.

Books for Reference

1. Chaturvedi, R.P. (2015). *Hindi vyakarana*. Upakar Prakashan.
2. Ramdev. (2016). *Vyakaran Pradeep*. Hindi Bhavan.

- Gosamy, K. (2016). *Anuvad vigyan ki Bhumika*. Rajkamal Prakashan.
- Shukla, A. R (2021). *Hindi Sahitya Ka Itihas*, Prabhat Prakashan.

Websites and eLearning Sources

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

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of the course, the student will able to	
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	analyze the human values expressed in life and literature of Hindi Novelist “Mamatha Kaliyah”.	K4
CO5	evaluate the film & Literary works in Hindi.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course					Hours	Credits				
4	23UHI41GL04	Hindi - 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	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	23USA41GL04	Sanskrit - 4	4	3

Course Objectives
To give an exposure to Sanskrit drama in general
To showcase the structure of pre-kalidasa 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)

Sanskrita 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)

Sanskrita Racanani Vubhavoga

Teaching Methodology	Videos, PPT, Blackboard, Demonstration, Exercises
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Books for Study

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

Books for Reference

1. Vadhyar, R.S. & Sons. (2019). *History of Sanskrit Literature*. Book - sellers and publishers , Kalpathu ,Palghat, Kerala, south India,
2. Kulapathy, Saral, K.M. (2018). *Sanskrit Balabodh , Bharathita vidya bhavan* , Munshimarg.
3. Bharathi. (2019). *Vadatu sanskritam - Samaskara Binduhu*. S. Aksharam 8th cross, 2nd phase Giri nagar Bangalore.

Websites and eLearning Sources

1. https://sanskritdocuments.org/doc_z_misc_major_works/daily.pdf
2. <https://www.learn Sanskrit.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 - Level)
	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	23USA41GL04	Sanskrit - 4									4	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	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/week	Credits
4	23UEN42GE04	General English - 4	5	3

Course Objectives

To develop and enhance language proficiency in listening, reading, and writing skills through teacher-led reading practice, and comprehension exercises.

To encourage creative thinking through creative tasks and essay writing.

To foster effective communication skills by engaging in tasks that require note-taking, note-making, précis writing, paragraph writing, and the synthesis of information from different sources.

To strengthen grammatical skills by focusing on the application of different tenses and to emphasise grammatical accuracy in various writing tasks.

To encourage students to critically engage with media content and evaluate information.

UNIT I: Women Through the Eyes of Media

(13 Hours)

1.0 Introduction

1.1 Objectives

1.2 Listening and Reading Skills through Teacher-led Reading Practice

1.3 Glossary

1.3.1 Words

1.3.2 Phrases

1.4 Reading Comprehension

1.5 Critical Analysis

1.6 Creative Task

1.7 General Writing Skill: Writing Minutes of a Meeting

1.8 Grammar: Present Perfect Tense

UNIT II: Effects of Tobacco Smoking

(13 Hours)

1.9 Introduction

2.0 Objectives

2.1 Listening and Reading Skills through Teacher-led Reading Practice

2.2 Glossary

2.3.1 Words

2.3.2 Phrases

2.4 Reading Comprehension

2.5 Critical Analysis

2.6 Creative Task

2.7 General Writing Skill: Note-Taking

2.8 Grammar: Present Perfect Continuous Tense

UNIT III: Short Message Service (SMS)

(13 Hours)

2.9 Introduction

3.0 Objectives

3.1 Listening and Reading Skills through Teacher-led Reading Practice

3.2 Glossary

3.3.1 Words

3.3.2 Phrases

3.4 Reading Comprehension

3.5 Critical Analysis

3.6 Creative Task

3.7 General Writing Skill: Note-Making

3.8 Grammar: Past Perfect Tense

UNIT IV: An Engineer Kills Self as Crow Sat on his Head: A Newspaper Report (12 Hours)

- 3.9 Introduction
- 4.0 Objectives
- 4.1 Listening and Reading Skills through Teacher-led Reading Practice
- 4.2 Glossary
- 4.3.1 Words
- 4.3.2 Phrases
- 4.4 Reading Comprehension
- 4.5. Critical Analysis
- 4.6. Creative Task
- 4.7 General Writing Skill: Précis Writing
- 4.8 Grammar: Past Perfect Continuous Tense

UNIT V: Traffic Rules (12 Hours)

- 4.9 Introduction
- 5.0 Objectives
- 5.1 Listening and Reading Skills through Teacher-led Reading Practice
- 5.2 Glossary
- 5.3.1 Words
- 5.3.2 Phrases
- 5.4 Reading Comprehension
- 5.5 Critical Analysis
- 5.6 Creative Task
- 5.7 General Writing Skill: Paragraph Writing
- 5.8 Grammar: Future Perfect Tense

UNIT VI: A Handful of Answers: A Zen Tale (12 Hours)

- 5.9 Introduction
- 6.0 Objectives
- 6.1 Listening and Reading Skills through Teacher-led Reading Practice
- 6.2 Glossary
- 6.3.1 Words
- 6.3.2 Phrases
- 6.4 Reading Comprehension
- 6.5 Critical Analysis
- 6.6 Creative Task
- 6.7 General Writing Skill: Writing Short Essays on Current Issues/General Topics
- 6.8 Grammar: Future Perfect Continuous Tense

Teaching Methodology	Lecture Method, Use of ICT Tools and Interactive method
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Book for Study

1. Jayraj., & Arul, S.J. et al. (2016). *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*. Trinity.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	identify and explain key concepts and topics discussed in the course.	K1
CO2	understand the content by summarising, paraphrasing, and interpreting the materials presented.	K2
CO3	apply their knowledge to create various forms of written communication, such as meeting minutes, notes, précis, paragraphs, and essays.	K3
CO4	analyse the application of different tenses in various texts.	K4
CO5	synthesise their knowledge by creating creative tasks, including short essays on current issues and general topics	K5

Relationship Matrix											
Semester	Course Code		Title of the Course					Hours	Credits		
4	23UEN42GE04		General English - 4					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
4	23UCH43CC05	Core Course - 5: General Chemistry - 5	5	4

Course Objectives
To recognize the periodic trends of <i>p</i> -block elements and concept of stereochemistry
To understand the different types of oxides, hydrides nitrides and other important class of compounds formed by the <i>p</i> -block elements
To apply the knowledge stereochemistry in assigning the configuration of various stereoisomers.
To classify <i>p</i> -block elements based on their characteristics properties
To predict the product formation in addition reactions of alkenes based on stereochemistry and structure of important compounds formed by <i>p</i> -block elements

UNIT I: Chemistry of Group-16 Elements (15 Hours)

General characteristics - oxidation states, abundance of the elements, extraction and separation of dioxygen, uses, allotropy-oxides - different types of oxides based on chemical behaviour and oxidation state, chemistry of Ozone, differences between oxygen and other elements.

Extraction of sulphur, uses, -oxy acids of sulphur - sulfurous acid, sulphuric acid, Caro's acid and Marshall's acid. Oxo-acids of selenium and tellurium, compounds of sulphur and nitrogen, organo-derivatives.

UNIT II: Chemistry of Group-17 Elements (15 Hours)

Electronic structure and oxidation states, extraction of fluorine, chlorine, size of atoms and ions, Types of bonds formed and oxidation states, melting and boiling points, bonding energy in X₂ molecules-oxidizing power-reaction with water-hydrogen halides (HF, HCl, HBr and HI)-Ionic halides-molecular halides and bridging halides, preparation of anhydrous halides-halogen oxides (OF₂, O₂F₂, Cl₂O, ClO₂, Cl₂O₆, Cl₂O₇) and oxoacids (HOX, HXO₂, HXO₃ and HXO₄),-preparation, and hydrolysis of inter-halogen compounds (AX, AX₃, AX₅ and AX₇)-polyhalide ions-basic properties of halogens-pseudohalogens and pseudohalide ions.

UNIT III: Chemistry Group-18 Element (15 Hours)

Electronic structure-occurrence and recovery of the elements-physical and chemical properties- special properties of He, clathrates- chemistry of xenon-structure and bonding in xenon fluorides (XeF₂, XeF₄ and XeF₆), structure of some xenon compounds (XeO₃, XeOF₄, XeO₂F₂, [XeO₆]⁴⁻, XeO₄)
-Uses of noble gases.

UNIT IV: Stereochemistry - I (15 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, conformational analysis.

UNIT V: Stereochemistry - II (15 Hours)

Chirality, asymmetric centre, isomers with one asymmetric centre, asymmetric centre and stereocenter, drawing enantiomers, notations - *R*, *S* system, Cahn Ingold Prelog Rules, naming using perspective formula, Fischer projection, optical activity, polarimeter, compounds with more than one asymmetric center, diastereomers, meso compounds, naming isomers with more than one asymmetric center, nitrogen and phosphorous asymmetric centers, separation of enantiomers.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for study

- Lee, J. D. (1996). *Concise Inorganic Chemistry*, (5th Ed.). Blackwell Science Ltd. Oxford.
Unit I: Chapter 12 and 13
Unit II: Chapter 14 and 15
Unit III: Chapter 16 and 17

2. Bruice, P. Y. (2011). *Organic Chemistry*, (8th Ed.). Pearson Ltd. University of California.

Unit IV: Chapter 4

Unit V: Chapter 4 and 6

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. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (2015). *Basic Inorganic Chemistry*, (3rd Ed.). John Willey and Sons. Inc.
4. Morrison, R. T., & Boyd, R. N. (2011). *Organic Chemistry*, (7th Ed.). Allyn and Bacon. Ltd.
5. Purcell, K. F., & Kotz, J. C. (2010). *Inorganic Chemistry*. Cengage Learning.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO1	describe the general characteristics of p- block elements and basics of stereochemistry	K1
CO2	understand the basics periodic trends of p-block elements.	K2
CO3	apply the concepts chirality in order to assign the configuration and conformations organic molecules	K3
CO4	analyse the structure of various hydrides, oxides, nitrides of p-block elements based on the periodic trends	K4
CO5	predict the product of various organic reactions based on the principles of stereochemistry and reactivity of p-block elements	K5

Relationship Matrix											
Semester	Course Code		Title of the Course							Hours	Credits
4	23UCH43CC05		Core Course - 5: General Chemistry - 5							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	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										2.2 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UCH43CC06	Core Course - 6: General Chemistry - 6	5	4

Course Objectives
To understand the structure of crystal and its determination
To explain the ideal and non-ideal solutions
To analyse the different colligative properties and its determination
To compare and contrast between the properties of different colloidal solutions
To describe the structures and applications of nanomaterials

UNIT I: Solid State and Polarization (15 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. Polarization of molecules in an electric field - polarizability and dipole moment - induced and orientation polarization - Clausius Mosotti equation - applications of dipole moment measurement of molar polarization.

UNIT II: Solutions (15 Hours)

Kinds of solutions - definition of the ideal solution - analytical form of the chemical potential in ideal liquid solutions - changes in state with increase in temperature - fractional distillation - azeotropes -ideal dilute solution - chemical potentials in the ideal dilute solution - Henry's law and the solubility of gases - distribution of a solute between two solvents - chemical equilibrium in the ideal and non-ideal solutions - application of the Gibbs-Duhem equation - colligative properties - freezing-point depression - solubility - elevation of the boiling point - osmotic pressure - abnormal molecular mass - Van't Hoff factor - degree of dissociation and degree of association of solutes.

UNIT III: Colloidal State (15 Hours)

Colloids - types of colloidal solutions - classification - preparation - purification - properties - electrical and electro kinetic properties - determination of size of particles - hydrophile-lipophile balance-surfactants - micelle formation - factors affecting critical micelle concentration in aqueous media - micellar catalysis - emulsification by surfactants - macro emulsions - gels and their applications - application of colloids.

UNIT IV: Nanomaterials (15 Hours)

Nanomaterials-Introduction-History and Scope-Clusters and Magic numbers -Nano size and properties-Classification of nanostructured materials (0D,1D,2D,3D)-Fascinating nanostructures -Nanowires-Nanorods-Nanoshells-Nanotubes-Nanofluids-Applications of nanomaterials-Electronic devices-Medicine-Catalysis-Elimination of pollutants-Sports-Textiles.

UNIT V: Polymer Science (15 Hours)

Introduction to polymers- monomers- polymerization- types of polymerizations methods Addition polymerization and condensation polymerization - Thermoplastics and thermos settings- classification of polymers - properties of polymers - molecular weight- viscosity-mechanical property - molecular weight relationships - number average and weight average molecular weight - optical property-Glass transition temperature - Applications of polymers.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

- Atkins, P. W., & Paula, J. D. (2006). Atkins' Physical Chemistry, (8th Ed.). Oxford University Press.

Unit I: Chapter 20

Unit II: Chapter 5

Unit III: Chapter 19

2. Murty, B. S., Shankar, P., Baldev Raj, Rath, B. B. & James Murday. (2012). *Textbook of Nanoscience and Nanotechnology*. Universities Press.

Unit IV: Chapter 1

3. Gowariker, V. R., Viswanathan, N. V., Sreedhar, J. (2021). *Polymer Science*, (4th Ed.). New Age International (P) Ltd.

Unit IV: Chapter 3,4,5,6,9 & 10**Books for Reference**

4. Lee, J. D. *Concise Inorganic chemistry*, (5th Ed.). Wiley Blackwell publications.
 5. Puri., Sharma., & Pathania. (2012). *Principles of Physical Chemistry*, (46th Ed.). Vishal Publishing Co.
 6. Billmeyer, F.W. (1994). *Textbook of polymer science*, (3rd Ed.). John Wiley.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of course, students will be able to	
CO1	understand the manufacture of ceramic materials	K1
CO2	compare and contrast between the different kinds of solutions	K2
CO3	describe the polymerization processes	K3
CO4	apply the concepts of colloidal state to understand the cleansing action of soap and detergents	K4
CO5	evaluate the nanomaterials for next generation	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
4	23UCH43CC06	Core Course - 6: General Chemistry - 6									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	3	2	3	2	3	2	1	2.3	
CO2	2	3	2	2	3	3	2	2	2	1	2.2	
CO3	3	3	2	3	3	2	3	2	2	1	2.4	
CO4	3	2	2	3	3	2	2	3	2	1	2.3	
CO5	3	3	2	2	2	2	2	2	2	1	2.1	
Mean Overall Score											2.25 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UCH43CP04	Core Practical - 4: Physical Chemistry - 2	3	2

Course Objectives
To prepare solutions of different concentrations
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 Practical (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 (CH_3COOH Vs NaOH).

Books for Study

1. *Lab Manual*. Department of Chemistry. St. Joseph's College (Autonomous). Tiruchirappalli.
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., & Warren, J. W. (1970). *Experimental Physical Chemistry*, (7th Ed.). Mc Graw Hill.
4. Findlay, A. (1959). *Practical Physical Chemistry*, (7th Ed.). Longman.

Websites and eLearning Sources



Conductometric
Precipitation Titration



CST of phenol-water system.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO1	describe the theoretical concepts while performing experiments	K1
CO2	acquire practical skill on phase rule, conductometry and potentiometry	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	23UCH43CP04	Core Practical - 4: Physical Chemistry - 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										2.5 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UCH43AO02A	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's explanation 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	Demo Videos, PPT, Handouts, Study materials
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Book 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

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

Websites and eLearning Sources*

- <https://archive.nptel.ac.in/courses/115/107/115107131/>
- <https://archive.nptel.ac.in/courses/115/105/115105100/>
- <https://archive.nptel.ac.in/courses/115/103/115103101/>
- <https://archive.nptel.ac.in/courses/115/101/115101011/>
- <https://nptel.ac.in/courses/117106086>

(* 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	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	23UCH43AO02A	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	23UCH43AO02B	Allied Optional - 2: Communication Electronics	4	3

Course Objectives

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.

UNIT III: Optical Communication Sources and Detectors (12 Hours)

Introduction, LEDs, Phototransistor characteristics- Photo detector noise, Response time, double hetero junction structure, comparison of photo detectors -LM393 light sensor module TCS3200 color sensor module.

UNIT IV: 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 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	Chalk and Talk, PPT
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Book 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

2. 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	23UCH43AO02B	Allied Optional - 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	23UCH43OP01A	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 ρ
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	23UCH43OP01B	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. Interfacing RFID module using Arduino.
21. Interfacing IIC memory module using Arduino.
22. Interfacing HC-05 bluetooth module with arduino
23. Study of Parallel port for I/O operations
24. Study of Serial port data transfer to hyper-terminal.
25. Study of Colour sensing using TCS3200.

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UHE44VE04A	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: Counselling for Adolescents (6 Hours)

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

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 Adolescence*, page no: 211-224 (2011).
2. Larry, R. C. (2000). *Disaster Management and Preparedness*, Lewis Publications.
3. Hurlock, E.B. (2001). *Developmental Psychology: A: Life-Span Approach*. (5th Ed.). Tata McGraw-Hill.
4. Sangha., & Kamaljit. (2015). *Ways to Live in Harmony with Nature: Living Sustainably and*

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	23UHE44VE04A	Value Education - 4: Social Ethics - 2									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)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UHE44VE04B	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	Chalk and Talk, Power point, assignment and Group discussion
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Book for Study

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

Book for Reference

- (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	23UHE44VE04B	Value Education - 4: Religious Doctrine - 2									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	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
5	23UCH53CC07	Core Course - 7: Organic Chemistry - 1	6	5

Course Objectives
To recall the nomenclature and important reactions of carbonyl compounds
To comprehend the reactions of carboxylic acids and their derivatives
To apply C-C bond making strategies using many carbon nucleophiles
To identify the reactivity order, acidity and basicity of active methylene compounds, amines, nitro compounds and nitriles
To criticize the reactivity and aromaticity of heterocyclic compounds

UNIT I: Aldehydes and Ketones (18 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: acetyl ions and cyanide ions - reaction with hydrideion: NaBH₄ and LiAlH₄-reactions with nitrogen nucleophiles: primary and secondary amines - formation of imine derivatives: oxime, hydrazine and semicarbazone -Wolff-Kishner reduction- Clemmensen reduction - addition of oxygen nucleophiles: water, alcohol- addition of sulphur nucleophiles: thiols - Wittig reaction.

UNIT II: Carboxylic acids and their Derivatives (18 Hours)

Nomenclature of carboxylic acids, acyl halides, acid anhydrides, esters, lactones, amides and lactams-structure of carboxylic acid and derivatives-preparation of carboxylic acid derivatives - physical properties-naturally occurring carboxylic acids and derivatives - acid strength of carboxylic acids and derivatives - nucleophilic substitution reactions - reaction coordinate diagram - 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 - transesterification - hydroxide ion promoted ester hydrolysis.

UNIT III: Active Methylene Compounds and Organometallic Compounds (18 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 - acid catalyzed and base promoted halogenation of α -carbon -haloform reaction - HVZ reaction -alkylation of the β -carbon: the Michael reaction - the aldol addition - dehydration of aldol products - 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: Nitro compounds, Amines and Nitriles (18 Hours)

Nitration of benzene, toluene, acetophenone, *p*-nitrotoluene and *m*-nitrotoluene - Reducing a nitro substituent - Halogenation of nitrobenzene - Deactivating effect of nitro group in aromatic compounds - *pK_a* value 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 nitro benzenes containing halogen substituents (S_NAr reaction) - Mechanism Reactions of amines as bases and nucleophiles - Structure and medicinal uses of alkaloids: caffeine, nicotine, ephedrine and morphine Naming nitriles - Reaction of nitriles - Mechanism for the acid-catalyzed hydrolysis of a nitrile

UNIT V: Heterocycles (18 Hours)

Aromatic Heterocyclic compounds: structure of pyridine, pyrrole, furan, thiophene, quinoline, indole, imidazole, purine, pyrimidine, caffeine, nicotine, morphine, heroin - Electrophilic aromatic substitution reactions and resonance contributors of pyrrole, thiophene and furan - Nucleophilic substitution in pyridine Aliphatic heterocyclic compounds: structure of aziridine, pyrrolidine, piperidine, oxirane, THF, THP - Acidity comparison of pyrrolidine, piperidine, morphine and N-methylpyrrolidine - Basicity comparison of pyrrole, pyrrolidine and pyridine

Books for Study

1. Bruice, P. Y. (2011). *Organic Chemistry*, (8th Ed.). Pearson Ltd. University of California.
Unit-I Chapter 16
Unit-II Chapter 15
Unit-III Chapter 17
Unit-IV Chapter 18
2. Clayden, J., Greeves, N., & Warren, S. (2001). *Organic Chemistry*, (1st Ed.). Oxford University Press.
Unit-III Chapter 9
Unit-V Chapter 43

Books for Reference

1. Pine, S. H. (1986). *Organic Chemistry*, (4th Ed.). Mc Graw-Hill International Book Company.
2. Finar, I. L. (1996). *Organic Chemistry*. Vol 1 and 2, (6th Ed.). Addison Wesley Longman Ltd.
1. Solomons, G. T. W. (1996). *Organic Chemistry*, (6th Ed.). John Wiley and Sons.
2. Wade, L. G. (2003). *Organic Chemistry*, (5th Ed.). Pearson Ltd. University of California.
3. Carey, F. A. (2000). *Organic Chemistry*, (4th Ed.). Mc Graw-Hill International Book Company.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of the course, students will be able to	
CO1	describe the nomenclature and name reactions which involve carbonyl compounds	K1
CO2	outline the concepts of keto-enol tautomerism, direct and conjugate additions	K2
CO3	apply carbon nucleophiles in C-C bond making	K3
CO4	identify the extent of acidity and basicity of various organic compounds	K4
CO5	criticize the reactivity and aromaticity of heterocyclic compounds	K5

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
5	23UCH53CC07	Core Course - 7: Organic Chemistry - 1								6	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	1	2	3	1	2	2	3	2	3	2.2
CO2	2	2	3	2	3	2	2	3	2	1	2.2
CO3	1	1	3	3	3	2	2	3	1	2	2.5
CO4	2	3	1	3	1	3	3	2	2	3	2.5
CO5	2	3	1	2	1	1	3	1	2	1	2.1
Mean Overall Score										2.3 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UCH53CP05	Core Practical - 5: Organic Qualitative Analysis and Determination of Physical Constants	8	5

Course Objectives

To learn the techniques of organic qualitative analysis
To test the elements being present in the organic compounds
To prepare the derivatives of the organic compounds
To learn the determination of physical constants of organic compounds

UNIT I: Preliminary tests (24 Hours)

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 (24 Hours)

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 (24 Hours)

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 (24 Hours)

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 (24 Hours)

Determination of melting and boiling points of organic compounds of MP/BP below 200 degreecelcius. (A minimum of 5 compounds each.)

Books for Reference

1. *Organic Chemistry Lab Manual for Micro Qualitative Analysis*. Department of Chemistry. St. Joseph's College. (Private circulation)
2. Furniss, B. S. *et al.* (1984). *Vogel's Textbook of Practical Organic Chemistry*, (7th Ed.). ELBS Longman.
3. Ganapragasm, N. S., & Ramamurthy, G. (2007). *Organic Chemistry Lab Manual*, (2nd Ed.). S. Vishwanathan Printers and Publishers (P) Ltd.
4. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry*, (2nd Ed.). Sultan Chand and Sons.

Course Outcomes

CO No.	CO-Statements	Cognitive Levels (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	23UCH53CP05	Core Practical - 5: Organic Qualitative Analysis and Determination of Physical Constants									8	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	1	2	2	3	3	2	1	3	2	2.2	
CO2	2	2	2	3	2	2	1	3	3	2	2.2	
CO3	3	2	2	3	3	2	3	2	2	3	2.5	
CO4	2	3	2	3	2	3	3	2	3	2	2.5	
CO5	3	3	2	1	2	2	2	3	2	1	2.1	
Mean Overall Score											2.3 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UCH53ES01A	Discipline Specific Elective - 1: Inorganic Chemistry - 1	5	3

Course Objectives
To describe the properties of inner transition elements.
To outline the basics of coordination chemistry.
To predict the structure and stability of complexes.
To infer about the nature of transition elements.
To correlate the electronic transition and structure of complexes.

UNIT I: Chemistry of Transition Elements (15 Hours)

Electronic configurations variation of atomic and ionic radii of transition elements across the period and down the group - variable oxidation state - magnetic properties - color -complexing tendency - alloy formation - catalytic properties.

UNIT II: Chemistry of Inner-transition 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 and complexes.

The Actinide Series

Electronic structure and position in the periodic table - actinide contraction - oxidation states - occurrence and preparation of the elements.

UNIT III: 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 (VBT).

UNIT IV: 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 π bonding - π acceptor ligands - π donor ligands.

UNIT V: Electronic Spectra of Complexes (15 Hours)

Energy levels in atoms - coupling of orbital momenta - coupling of spin momenta - spin -orbit coupling - terms and termsymbols - 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

Teaching Methodology	Chalk and Talk, PPT, Videos
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Books for Study

- Lee, J. D. (1996). *Concise Inorganic Chemistry*, (5th E d .). 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., & Gaus, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John Wiley and Sons. Inc.

Website and eLearning Sources



Group17Elements



Coordination Compounds



Innertransition Elements

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	describe the properties of inner transition elements.	K1
CO2	outline the basics of coordination chemistry.	K2
CO3	predict the structure and stability of complexes.	K3
CO4	infer about the nature of transition elements.	K4
CO5	correlate the electronic transition and structure of complexes.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
5	23UCH53ES01A	Discipline Specific Elective - 1: Inorganic Chemistry - 1									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	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	1	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	23UCH53ES01B	Discipline Specific Elective - 1: Inorganic Chemistry - 2	5	3

Course Objectives

To recall the basics of nuclear chemistry.
To outline the basics of inorganic polymers
To predict the structure and stability of complexes.
To infer about the nature of transition elements.
To correlate the electronic transition and structure of complexes.

UNIT I: Nuclear Chemistry (15 Hours)

The atomic nucleus - structure of the nucleus - liquid drop and shell models - forces in the nucleus - stability and the ratio of neutrons to protons - modes of decay - β emission, neutron emission, positron emission, orbital or K - electron capture, proton emission, gamma radiation - Half-life period - binding energy and nuclear stability - α decay - Soddy-Fajan's law of radioactive displacement - radioactive decay series - nuclear fission, fusion, atom bomb and hydrogen bomb.

UNIT II: Inorganic Polymers (15 Hours)

General properties - classification of inorganic polymers based on element in the backbone (S, B and P) - preparation and properties of phosphorous based polymers (polyphosphazene and polyphosphonitrilic chloride), sulphur based polymer (polysulphide and polymeric sulphur nitride), boron based polymers (borazine polymers) - industrial applications of inorganic polymers

UNIT III: 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 (VBT).

UNIT IV: 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-Tellereffect) - MO theory of complexes with and without π bonding - π acceptor ligands - π donor ligands.

UNIT V: Electronic Spectra of Complexes (15 Hours)

Energy levels in atoms - coupling of orbital momenta - coupling of spin momenta - spin-orbit coupling - terms and termsymbols - 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

Teaching Methodology	Chalk and Talk, PPT, Videos
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Books for Study

- Lee, J. D. (1996). *Concise Inorganic Chemistry*, (5th Ed.). Black Well Science Ltd. Oxford.
Unit-I: Chapter 31
Unit-III: Chapter 7
Unit-IV: Chapter 7
Unit-V: Chapter 32
- Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2018). *Inorganic Chemistry*, (7th Ed.). Oxford University Press. Oxford.

Unit-III: Chapter 7, 20

Unit-IV: Chapter 20

Unit-V: Chapter 20

3. Mark, J. E., Allcock, H. R., & West, R. (1992). *Inorganic Polymers*. Prentice Hall.

Unit-II: Chapter 6

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., & Gaus, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John Wiley and Sons. Inc.

Website and eLearning Sources



Nuclear Chemistry



Coordination Compounds



Inorganic polymers

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	recall the basics of nuclear chemistry.	K1
CO2	outline the basics of inorganic polymers	K2
CO3	predict the structure and stability of complexes.	K3
CO4	infer about the nature of transition elements.	K4
CO5	correlate the electronic transition and structure of complexes.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
5	23UCH53ES01B	Discipline Specific Elective - 1: Inorganic Chemistry - 2									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	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	1	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	23UCH53ES02A	Discipline Specific Elective - 2: Physical Chemistry - 1	5	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 electrochemical cells in construction of electrochemical cells and fuel cells

UNIT I: Spectroscopy I (15 Hours)

The absorption and emission of radiation- selection rules and transition moments-Beer-Lambert's 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 - Frank-Condon principle - spectra of diatomic and polyatomic molecules- predissociation - dissociation energy-applications.

UNIT II: Spectroscopy II (15 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- Applications of IR and Raman spectroscopy.

UNIT III: Electrochemistry (15 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 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 and Electromotive Force (15 Hours)

Applications of conductance measurements- determination of degree of dissociation - determination of K_a 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 -derivation of cell EMF - sign conventions - electrochemical series and its significance - computation of cell EMF- Weston-Cadmium standard cell - 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, Nernst Equation, EMF Measurements and fuel cells (15 Hours)

Types of reversible electrodes - gas/metal ion - metal/metal ion - metal/insoluble/anion - redox electrodes -electrode reaction -single electrode potential -reference electrodes - standard hydrogen electrode - standard electrode potential - Nernst equation of electrode reaction and cell reaction-- 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 pK_a of acids by potentiometry- energy conversion - dry cell, lead acid storage battery, H_2-O_2 fuel cell.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

1. Puri, B. R., Pathania, M. S., & Sharma, L. R. (2020). *Principles of Physical Chemistry*, (48th Ed.). Vishal Publishing Co.
2. Atkins, P., & Paula, J.D. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.

Books for Reference

1. Castellan, G. W. (1983). *Physical Chemistry*, (3rd Ed.). Addison-Wesley Publishing Company.
2. Glasstone, S. (2008). *An Introduction to Electrochemistry*. Affiliated East-West Press Pvt. Ltd.
3. Banwell, C. N., & Cash, Mc. E. M. (2002). *Fundamentals of Molecular Spectroscopy*, (4th Ed.). McGraw-Hill Publishing Company Limited.
4. Bockris, J. O'M., & Reddy, A. K. N. (2000). *Modern Electrochemistry 1 and 2A*. Kluwer Academic Plenum Publishers.

Websites and eLearning Sources

1. Infrared (IR) spectroscopy | Resource | RSC Education
2. 4.1: Introduction to Infrared Spectroscopy - Chemistry Libre Texts
3. Bing Videos
4. Bing Videos

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
CO1	describe the principles of electronic spectroscopic techniques and electrolysis	K1
CO2	understand the basics of selection rules and electrolytic processes	K2
CO3	apply the concepts spectroscopy in structure elucidation and of EMF in electrochemical reactions	K3
CO4	analyze the UV and IR spectral data and construct electrodes, galvanic cells and batteries	K4
CO5	compare the different spectral techniques and assess the applications of conductance measurements	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
5	23UCH53ES02A	Discipline Specific Elective - 2: Physical Chemistry - 1									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	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	3	3	3	2	2	3	1	2	3	2.3	
CO4	1	3	1	3	3	2	2	3	3	1	2.2	
CO5	2	1	1	3	1	2	1	3	1	3	1.8	
Mean Overall Score											2.1 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UCH53ES02B	Discipline Specific Elective - 2: Physical Chemistry - 2	5	3

Course Objectives
To recognize the principles of spectroscopy, nuclear chemistry, Corrosion and nano chemistry
To understand the different spectroscopic techniques, nuclear reactions, mechanism in corrosion and preparation of nano materials
To apply the knowledge of spectroscopy, nuclear reaction, corrosion and nano chemistry in structure elucidation, fission and fusion process and characterizing nanomaterials
To classify the spectroscopic, nuclear, prevention of corrosion and nano techniques
To justify the concepts of spectroscopy in structure elucidation, studying nuclear decay, prevention of corrosion and uses of nanomaterials

UNIT I: Spectroscopy I (15 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 - Frank-Condon principle - spectra of diatomic and polyatomic molecules- predissociation - dissociation energy-applications.

UNIT II: Spectroscopy II (15 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- Applications of IR and Raman spectroscopy.

UNIT III: Nuclear Chemistry (15 Hours)

The atomic nucleus - structure of the nucleus -liquid drop and shell models-forces in the nucleus-stability and the ratio of neutrons to protons-modes of decay - β emission, neutron emission, positron emission, orbital or K-electron capture, proton emission, gamma radiation - half-life period-binding energy and nuclear stability- α decay-Soddy-Fajan's law of radioactive displacement-radioactive decay series-nuclear fission, fusion, atom bomb and hydrogen bomb.

UNIT IV: Corrosion of Metals (15 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.

UNIT V: Nano Chemistry (15 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 - synthesis - catenanes and rotaxanes- preparation and properties - applications of nanomaterials.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

1. Puri, B. R., Pathania, M. S., & Sharma, L. R. (2020). *Principles of Physical Chemistry*, (48th Ed.). Vishal Publishing Co.

- Atkins, P., & Paula, J.D. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press
- Pradeep, T. (2009). *Nano: The Essentials-Understanding Nanoscience and Nanotechnology*. McGraw-Hill Education

Books for Reference

- Glasstone, S. (2008). *An Introduction to Electrochemistry*. Affiliated East-West Press Pvt. Ltd.
- Banwell, C. N., & Cash, Mc. E. M. (2002). *Fundamentals of Molecular Spectroscopy*, (4th Ed.). McGraw-Hill Publishing Company Limited.

Websites and eLearning Sources

- Infrared (IR) spectroscopy | Resource | RSC Education
- Bing Videos
- Bing Videos
- Bing Videos

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	describe the principles of spectroscopic, nuclear, corrosion and nano techniques	K1
CO2	understand the basics of spectroscopic selection rules, nuclear reactions, corrosion process and nano materials	K2
CO3	apply the concepts of spectroscopy in structure elucidation, nuclear power generation, prevention of corrosion and nano material preparation	K3
CO4	analyze the UV and IR spectral data, methods of energy generation, corrosion prevention and nano material characterization	K4
CO5	compare the different spectral, nuclear, corrosion and nano techniques	K5

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
5	23UCH53ES02B	Discipline Specific Elective - 2: Physical Chemistry - 2								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	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	3	3	3	2	2	3	1	2	3	2.3
CO4	1	3	1	3	3	2	2	3	3	1	2.2
CO5	2	1	1	3	1	2	1	3	1	3	1.8
Mean Overall Score										2.1 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UCH53SP01	Self-paced 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 examine the different routes of synthesis of organic reagents and their applications
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 - bionano composites- 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, B₂H₆, CH₂Cl₂, DCC, Grignard reagent, NBS, Ph₃P, PCl₅, NaN₃, NaNO₂, SOCl₂, Me₂S and Me₂CuLi.

UNIT V: Organic Redox Reagents

Structures and applications of the following oxidants- PCC, H₂O₂, m-Cpba, OsO₄, KMnO₄, HIO₄, and SeO₂. Reductants- LiAlH₄, NaBH₄, Raney nickel, Wilkinson catalyst, Lindlar's Catalyst, MPV, Clemmensen and Wolff-Kishner reductions and Birch reduction.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

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

Books for Reference

- Atkins, P. W. (1994). *Physical Chemistry*, (5th Ed.). Oxford University Press.
- Finar, I. L. (1996). *Organic Chemistry*, Vol 1 and 2, (6th Ed.). Addison Wesley Longman Ltd.
- Miessler, G. L., Fischer, P. J., & 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, 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	relate the ability of the redox reagents and their reactions.	K4
CO5	examine the building blocks for advanced inorganic materials	K5

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
5	23UCH53SP01	Self-paced 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 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23USS54SE01	Skill Enhancement Course - 2: 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 group discussions

UNIT I: Communication Skills

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

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

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

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

UNIT V: Test of Reasoning

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

Book 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.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K - Level)
	On successful completion of this course, students will be able to	
CO1	analyse problems directed at testing their cognitive abilities	K3
CO2	present the best of themselves as job seekers and communicate effectively in all contexts	K4
CO3	assess themselves, set goals, and manage conflicts that are expected of a good leader	K5

Relationship Matrix											
Semester	Course Code		Title of the Course							Hours	Credits
5	23USS54SE01		Skill Enhancement Course - 2: Soft Skills							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	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
Mean Overall Score											2.5 (High)

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UCH63CC08	Core Course - 8: Organic Chemistry -2	6	5

Course Objectives				
To recognize the principles and applications of UV-Vis and IR spectroscopy				
To apply the knowledge of NMR, ESR and Mass spectroscopic techniques in finding out molecular structure				
To understand the structure, classification and preparation of amino acids and proteins				
To classify carbohydrates and nucleic acids to find out their structural differences				
To justify the importance of natural products like alkaloids, terpenoids and steroids in terms of their structure and functions				

UNIT I: UV-Visible and IR Spectroscopy (18 Hours)

UV-Visible spectroscopy: electronic transitions -principle -instrumentation-chromophores, auxochromes-factors influencing absorptions-conjugation-solvent effect- shifts in absorptions - absorption bands in carbonyl compounds - Woodward-Fisher rules for the calculation of λ_{\max} of dienes and enones. IR spectroscopy: Hooke's Law- sample handling- modes of vibrations inorganic molecules-factors influencing stretching frequency-hybridization, H-bonding, electronic, steric and ring size effects - IR spectra of functional groups - hydrocarbons: methyl, methylene, methine C-H stretching in alkanes and cycloalkanes - alcohols, ethers, aldehydes, ketones, amines, esters - comparison of stretching frequency in carbonyl compounds - NH stretching in primary and secondary amines.

UNIT II: NMR, ESR and Mass Spectrometry (18 Hours)

^1H NMR: Principle, instrumentation, number of signals, shielding and deshielding - chemical shift, factors influencing chemical shifts - hybridization and electronic effects -chemical shift values for different protons - spin-spin coupling and coupling constants-types of coupling constants- interpreting the NMR spectra of some organic molecules. ^{13}C NMR spectroscopy - types of carbon, splitting and chemical shift values for various types of carbons. ESR spectroscopy: Principle and applications to methyl and naphthyl radicals.

Mass spectrometry: principle-instrumentation-ionization techniques-CI and EI -m/z values - molecular ion peak - isotopic peaks - [M+1] and [M+2] and their importance - metastable ions -benzylic and allylic cleavages - nitrogen rule, McLafferty rearrangement-interpretation of the mass spectra of some organic molecules.

UNIT III: Amino acids and proteins (18 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 Peptide 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 IV: Carbohydrates and Nucleic acids (18 Hours)

Carbohydrates: 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. Nucleic acids: Types of bases - types of sugars - nucleosides and nucleotides -types of nucleic acids - structure and functions of DNA and RNA.

UNIT V: Natural Products (18 Hours)

Introduction to alkaloids - classification - occurrence and isolation - structural elucidation of papaverine and nicotine only - only structures of alkaloids: quinine, morphine, atropine, nicotine, coniine, piperine and papaverine - classification and definition of terpenoids -isoprene rule - structure and uses of some

essential oils - structural elucidation of geraniol only -structure and functions of steroids only-androgen, estrogen and cholesterol.

Teaching Methodology	Chalk and Talk, PPT, videos
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Books for Study

1. Pavia, D. L., Lampman, G. M., Kriz, G. S., & Vyvyan, J. R. (2015). *Introduction to Spectroscopy*, (5th Ed.). Cengage Learning.
2. Morrison, R. T., & Boyd, R. N. (2011). *Organic Chemistry*, (7th Ed.). Allyn and Bacon Ltd.
3. Finar, I. L. (1996). *Organic Chemistry*. Vol:1 and 2, (6th Ed.). Addison Wesley Longman Ltd.

Books for Reference

1. Kemp, W. (1987). *Organic Spectroscopy*, (3rd Ed.). ELBS.
2. Fleming, I. (1988). *Spectroscopic Methods in Organic Chemistry*, (4th Ed.). Tata-Mc Graw Hill Publishing Company.
3. Sharma, Y. R. (2013). *Elementary Organic Spectroscopy*, (5th Ed.). S. Chand & Company Pvt. Ltd.
4. Stryer, L., Berg, J. M., Tymoczko, J. L., & Gatto, G. (2019). *Biochemistry*, (9th Ed.). W. H. Freeman and Company.
5. Rodwell, D., Bender, D., & Botham, K. (2018). *Harper's Illustrated Biochemistry*, (31st Ed.). Mc Graw Hill Professional.

Websites and eLearning Sources

1. <https://www.khanacademy.org/test-prep/mcat/biomolecules>
2. <https://www.nios.ac.in/media/documents/313courseE/L31.pdf>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO1	describe the principle, instrumentation and applications of UV-V is and IR spectroscopy	K1
CO2	apply the principles of NMR, ESR and mass spectrometry in structural elucidation	K2
CO3	comprehend the structure, synthesis and analysis of amino acids and proteins.	K3
CO4	recollect the classification, chemical reactions and structures of sugars and nucleic acids.	K4
CO5	analyze the structure, composition and importance of alkaloids, terpenoids and steroids.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
6	23UCH63CC08	Core Course - 8: Organic Chemistry - 2									6	5
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcome (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											2.18 (Medium)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UCH63CP06	Core Practical - 6: Gravimetric Analysis and Organic Preparation	8	5

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

UNIT I: Theory of gravimetric analysis (24 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 (24 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 (24 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 (24 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 (24 Hours)

Preparation of organic compounds involving the following reactions:

1. Hydrolysis
2. Esterification
3. Nitration
4. Bromination
5. Oxidation
6. Diazotization
7. Osazone formation

Book for Study

1. *Laboratory Manual*. Department of Chemistry. St. Joseph's College (Autonomous).

Books for Reference

1. Jeffery, G. H., Bassett, J., Mendham, J. & Denney, R. C. (1989). *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.). Longman Scientific and Technical. Essex.
2. Furniss, B. S., Hannaford, A. J., Smith, P. W. G. & Tatchell, A. R. (1989). *Vogel's Textbook of Practical Organic Chemistry*, (5th Ed.). Longman Scientific and Technical. Essex.
3. Skoog, D. A., West, D. M., Holler, F. J. & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry*, (9th Ed.). Brooks/Cole Cengage Learning. Belmont.

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 the 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	23UCH63CP06	Core Practical - 6: Gravimetric analysis and organic preparation									8	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	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)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UCH63ES03A	Discipline Specific Elective - 3: Inorganic Chemistry - 3	5	3

Course Objectives
To list the thermal methods by which polymers and other minerals are characterized for their quality and composition.
To predict the reactivities of complexes and compare the different pathways they follow when they react.
To predict the role of different metal ions in biological systems.
To use the spectrophotometric techniques to test the pollution level of various segments of the current environment.
To explain the functioning of living systems and may pursue higher studies/research in related subjects.

UNIT I: Reaction mechanism in coordination complexes (15 Hours)

Ligand substitution reactions - rates of ligand substitutions - labile and inert complexes - classification of mechanisms - association, dissociation and interchange- ligand substitution in square planar complexes - the nucleophilicity of the entering group - the shape of the transition state - the trans effect - stereochemistry of substitution - pressure and temperature dependence of the substitution- ligand substitution in octahedral complexes- rate laws and their interpretation - the Eigen-Wilkins mechanism - the Fuoss-Eigen equation-the activation of octahedral complexes - leaving group effects - the effects of spectator ligands - steric effects - activation energetics - associative activation. Base hydrolysis - redox reactions - the inner sphere and outer sphere mechanisms.

UNIT II: Organometallic Chemistry (15 Hours)

Stable electron configurations - 18 electron compounds - 16 electron square planar compounds - electron count preference - electron counting and oxidation states - neutral ligand method - donor-pair method, nomenclature of organometallic compounds with special reference to hapticity - types of ligands - CO, phosphines, hydrides, dinitrogen, alkyl, alkenyl, alkynyl and aryl ligands, alkene and alkyne ligands, benzene and arene, cyclopentadiene.

UNIT III: Bio-Inorganic Chemistry (15 Hours)

Metal ions in biology and their vital role in the active site, structure and functions of metallo proteins and enzymes- ion transport mechanism in cell membrane - Na and K pumps - ionophores - structures and characteristic features of haemoglobin and myoglobin - Vitamin B₁₂ - blue copper proteins.

UNIT IV: Gravimetric and Thermogravimetric Methods (15 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 V: Colorimetry, spectrophotometry and spectrofluorimetry (15 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.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

1. Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2018). *Inorganic Chemistry*, (7th Ed.). Oxford University Press.

Unit-I: Chapter 21

Unit-II: Chapter 22

Unit-III: Chapter 26

2. Jeffery, G. H., Bassett, J., Mendham, J., & Denney R. C. (1989). *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.). Longman Scientific and Technical.

Unit-IV: Chapter 11

Unit-V: Chapters 17 and 18

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. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John-Wiley and Sons. Inc.
4. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry*, (9th Ed.). Brooks/Cole Cengage Learning.

Websites and eLearning Sources

1. <https://www.classcentral.com/course/swayam-coordination-chemistry-13964>
2. <https://www.openlearning.com/courses/introduction-to-coordination-chemistry/?cl=1>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
CO1	list the thermal methods by which polymers and other minerals are characterized for their quality and composition.	K1
CO2	predict the reactivities of complexes and compare the different pathways they follow when they react.	K2
CO3	predict the role of different metal ions in biological systems.	K3
CO4	use the spectrophotometric techniques to test the pollution level of various segments of the current environment.	K4
CO5	explain the functioning of living systems and may pursue higher studies/research in related subjects.	K5

Relationship Matrix												
Semester	Course Code	Title of the course									Hours	Credits
6	23UCH63ES03A	Discipline Specific Elective - 3: Inorganic Chemistry - 3									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	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	23UCH63ES03B	Discipline Specific Elective - 3: Inorganic Chemistry- 4	5	3

Course Objectives
To identify the chromatographic method by which separation or purification of materials are done.
To predict the reactivities of complexes and compare the different pathways they follow when they react.
To predict the role of different metal ions in biological systems.
To use the chromatographic methods to test extent to which the various segments of the current environment are polluted.
To explain the functioning of living systems and may pursue higher studies/research in related subjects.

UNIT I: Reaction Mechanism in Coordination Complexes (15 Hours)

Ligand substitution reactions - rates of ligand substitutions - labile and inert complexes - classification of mechanisms - association, dissociation and interchange, ligand substitution in square planar complexes - the nucleophilicity of the entering group - the shape of the transition state - the trans effect - stereochemistry of substitution - pressure and temperature dependence of the substitution in octahedral complexes - rate laws and their interpretation - the Eigen-Wilkins mechanism - the Fuoss-Eigen equation - activation of octahedral complexes - leaving group effects - the effects of spectator ligands - steric effects - activation energetics - associative activation - base hydrolysis - redox reactions - the inner sphere and outer sphere mechanisms

UNIT II: Organometallic Chemistry (15 Hours)

Stable electron configurations - 18 electron compounds - 16 electron square planar compounds - electron count preference - electron counting and oxidation states - neutral ligand method - donor -pair method, nomenclature of organometallic compounds with special reference to hapticity. Types of ligands - CO, phosphines, hydrides, dinitrogen, alkyl, alkenyl, alkynyl and aryl ligands, alkene and alkyne ligands, benzene and arene, cyclopentadiene.

UNIT III: Bio-inorganic Chemistry (15 Hours)

Metal ion in biology and their vital role in the active site - structure and functions of metallo proteins and enzymes. ion transport mechanism in cell membrane - Na and K pumps- ionophores - structures and characteristic features of haemoglobin and myoglobin - Vitamin B₁₂ - blue copper proteins.

UNIT IV: Column and Thin-layer Chromatography (15 Hours)

Introduction - Types of liquid chromatography - Equipment for HPLC - Derivatization - Quantitative analysis - Thin-layer chromatography - High performance thin-layer chromatography (HPLC) - Determination of aspirin, phenacetin and caffeine in a mixture - Thin-layer chromatography - The recovery of separated substances by elution techniques.

UNIT V: Gas Chromatography (15 Hours)

Introduction - apparatus - programmed - temperature gas chromatography - quantitative analysis by GLC - 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.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

- Weller, M., Overton, T., Rourke, J., & Armstrong, F. (2018). *Inorganic Chemistry*, (7th Ed.). Oxford University Press.

Unit-I: Chapter 21

Unit-II: Chapter 22

Unit-III: Chapter 26

2. Jeffery, G. H., Bassett, J., Mendham, J., & Denney R. C. (1989). *Vogel's Textbook of Quantitative Chemical Analysis*, (5th Ed.). Longman Scientific and Technical.

Unit-IV: Chapter 8**Unit-V: Chapter 9****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. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (1995). *Basic Inorganic Chemistry*, (3rd Ed.). John-Wiley and Sons.
4. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry*, (9th Ed.). Brooks/Cole Cengage Learning.

Websites and eLearning Sources

1. <https://www.classcentral.com/course/swayam-coordination-chemistry-13964>
2. <https://www.openlearning.com/courses/introduction-to-coordination-chemistry/?cl=1>

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of the course, the graduates will be able to	
CO1	identify the chromatographic method by which separation or purification of materials are done.	K1
CO2	predict the reactivities of complexes and compare the different pathways they follow when they react.	K2
CO3	predict the role of different metal ions in biological systems.	K3
CO4	use the chromatographic methods to test extent to which the various segments of the current environment are polluted.	K4
CO5	explain the functioning of living systems and may pursue higher studies/research in related subjects.	K5

Relationship Matrix												
Semester	Course Code	Title of the course									Hours	Credits
6	23UCH63ES03B	Discipline Specific Elective - 3: Inorganic Chemistry - 4									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	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	23UCH63ES04A	Discipline Specific Elective - 4: Physical Chemistry - 3	5	3

Course Objectives
To recognize the principles of kinetics, catalysis, photochemical reaction and group theory
To understand the different types of kinetics, catalysis, adsorption and group theory theories
To apply the knowledge of kinetics, catalysis adsorption, photochemical reaction and group theory
To analyze the techniques of kinetics, catalysis adsorption, photochemical reaction and group theory
To justify the concepts of kinetics, catalysis adsorption, photochemical reaction and group theory

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 and experimental).

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 - types of complex reactions - reversible or opposing, consecutive and parallel reaction.

UNIT III: Adsorption and Catalysis (15 Hours)

Homogeneous and heterogeneous catalysis - acid-base catalysis, inversion of cane sugar- 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.

UNIT IV: Kinetics of Photochemical Reactions (15 Hours)

Thermal chain reactions - H₂-Br₂ reaction - dissociation of acetaldehyde - comparison of thermal and photochemical chain reactions. photochemical reaction - 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 (15 Hours)

Symmetry operations and symmetry elements -the symmetry classification of molecules - groups - consequences of symmetry - polarity - chirality - symmetry operations - matrix representations - construction of character table.

Teaching Methodology	Videos, PPT, demonstration, group discussion and creation of models
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Books for Study

- Rajaram, J., & Kuriacose, J. C. (1993). *Kinetics and Mechanism of Chemical Transformation*, (1st Ed.). Macmillan India Ltd.
Unit-I - IV Chapter 2,4,5,6,9,10 and 11
- Laidler, K. J. (1987). *Chemical Kinetics*, (3rd Ed.). Pearson Publication.
Unit-I - IV Chapter 1, 2, 4,5,7,8 and 10
- Cotton, F. A. (1990). *Chemical Applications of Group Theory*, (3rd Ed.). John Wiley and Sons.
Unit-V Chapter 2 and 3

Books for Reference

- Castellan, G. W. (2004). *Physical Chemistry*, (4th Ed.). Narosa.

- Bhattacharya, P. K. (1986). *Group Theory and its Chemical Applications*. Himalaya Publishing House.
- Sharma, K. K., & Sharma, L. K. (2012). *A Textbook of Physical Chemistry*, (5th Ed.). Vikas Publishing House.
- Atkins, P., & Paula, J.D. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO1	describe the principles of kinetics, catalysis adsorption, photochemical reaction and group theory	K1
CO2	understand the basics of kinetics, catalysis adsorption, photochemical reaction and group theory	K2
CO3	apply the concepts kinetics, catalysis adsorption, photochemical reaction and group theory	K3
CO4	analyze the kinetic parameters, adsorption isotherms, photochemical aspects and symmetry aspects of group theory	K4
CO5	compare the different kinetic, adsorption photochemical and group theory techniques	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
6	23UCH63ES04A	Discipline Specific Elective - 4: Physical Chemistry - 3									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	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	1	2	2.0	
CO4	1	3	1	2	3	2	2	3	3	1	2.1	
CO5	1	1	2	3	1	2	3	2	3	3	2.1	
CO6	1	2	2	2	3	1	2	3	2	2	2.0	
Mean Overall Score											2.1 (High)	

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UCH63ES04B	Discipline Specific Elective - 4: Physical Chemistry - 4	5	3

Course Objectives
To recognize the principles of kinetics, catalysis, thermo-chemistry and statistical thermo-chemistry
To understand the different types of kinetics, catalysis, thermo-chemistry and statistical thermo-chemistry
To apply the knowledge of kinetics, catalysis adsorption thermo-chemistry and statistical thermo-chemistry
To analyze the techniques of kinetics, catalysis adsorption, thermo-chemistry and statistical thermo-chemistry
To justify the concepts of kinetics, catalysis adsorption, photochemical reaction and group theory

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 and experimental).

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.

UNIT III: Adsorption and Catalysis (15 Hours)

Homogeneous and heterogeneous catalysis - acid-base catalysis, inversion of cane sugar- 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.

UNIT IV: Thermochemistry (15 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.

UNIT V: Statistical Thermodynamics (15 Hours)

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.

Books for Study

- Rajaram, J., & Kuriacose, J. C. (1993). *Kinetics and Mechanism of Chemical Transformation*, (1st Ed.). Macmillan India Ltd.
Unit-I - IV Chapter 2,4,5,6,9,10 and 11
- Laidler, K. J. (1987). *Chemical Kinetics*, (3rd Ed.). Pearson Publication. Laidler
Unit-I - IV Chapter 1, 2, 4,5,7,8 and 10
- Cotton, F. A. (1990). *Chemical Applications of Group Theory*, (3rd Ed.). John Wiley and Sons.
Unit-V Chapter 2 and 3

Books for Reference

- Castellan, G. W. (2004). *Physical Chemistry*, (4th Ed.). Narosa.
- Bhattacharya, P. K. (1986). *Group Theory and its Chemical Applications*. Himalaya Publishing

House.

- Sharma, K. K., & Sharma, L. K. (2012). *A Textbook of Physical Chemistry*, (5th Ed.). Vikas Publishing House.
- Atkins, P., & Paula, J.D. (2014). *Physical Chemistry*, (10th Ed.). Oxford University Press.

Websites and eLearning Sources



Symmetry elements and operations



Photochemistry

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students should be able to	
CO1	define rate, order and molecularity of reactions.	K1
CO2	understand the basics of statistical thermodynamics	K2
CO3	distinguish unimolecular and bimolecular surface reactions.	K3
CO4	apply the concepts of thermo chemistry	K4
CO5	understand the theories of reaction rate	K5

Relationship Matrix											
Semester	Course Code		Title of the Course							Hours	Credits
6	23UCH63ES04B		Discipline Specific Elective - 4: Physical Chemistry - 4							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	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	1	2	2.0
CO4	1	3	1	2	3	2	2	3	3	1	2.1
CO5	1	1	2	3	1	2	3	2	3	3	2.1
CO6	1	2	2	2	3	1	2	3	2	2	2.0
Mean Overall Score										2.1 (High)	

Semester	Course Code	Title of the course	Hours/Week	Credits
6	23UCH63CE01	Comprehensive Examination	-	2

Course Objectives

Evaluate candidate's understanding of basic concepts, principles and theories in various branches of chemistry
Asses the ability to solve complex problems related to different areas of chemistry including inorganic, organic and physical chemistry.
Evaluate the capacity for critical thinking, logical reasoning and analytical skills in the context of chemical problems.
Encourage an integrated understanding of chemistry, encompassing inorganic, organic and physical chemistry aspect.
Encourage innovative thinking and creativity in approaching and solving chemical problems.

UNIT I: Inorganic Chemistry 1

Periodic Table: details of the element's periodic classification as well as periodicity in all the properties along with general methods of isolation and the process of purification of elements, etc. Chemical Bonding and Shapes of Compounds. details of VSEPR theory and shapes of molecules; hybridization and dipole moment. It also defines ionic solids along with the structure of NaCl and CsCl, diamond and graphite; lattice energy, etc.

Main Group Elements specially for s and p blocks: formation of electron-deficient compounds containing some elements from the primary group; under transition elements and coordination compounds and inner transition elements.

UNIT II: Organic Chemistry

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.

Organic Reaction Mechanism and Synthetic Applications: Chemistry of reactive intermediates covering carbocations, carbanions, free radicals, carbenes, nitrenes along with benzynes, etc.; Hofmann-Curtius-Lossen rearrangement, Wolff rearrangement, Simmons-Smith reaction. It also covers Reimer-Tiemann reaction, Michael reaction, Darzens reaction, Wittig reaction, and McMurry reaction; Pinacol-pinacolone, Favorskii, benzilic acid rearrangement, dienone-phenol rearrangement, Baeyer - Vileger reaction, and many more. Qualitative Organic Analysis: UV, IR and ¹H NMR spectroscopic techniques as tools for structural elucidation.

UNIT III: Physical Chemistry

Atomic and Molecular Structure: Bohr's theory of hydrogen-like atom; wave-particle duality; uncertainty principle; Schrödinger's wave equation. Apart from that quantum numbers; shapes of orbitals; exclusion principle of Hund's rule and Pauli's; details of the electronic configuration of simple homonuclear diatomic molecules, etc. Theory of Gases: Kinetic theory of gases; distribution law of Maxwell-Boltzmann and concept of equipartition of energy. Solid State: Crystals and crystal systems; X-rays; structures of NaCl and KCl; close packing; the concept of atomic and ionic radii; radius ratio rules along with lattice energy; Born-Haber cycle; isomorphism and heat capacity of solids.

Chemical Thermodynamics: Reversible and irreversible processes; the concept of first law and details on its application to ideal and nonideal gases; thermochemistry; second law in detail; entropy and free energy and criteria for spontaneity. Chemical and Phase Equilibria from Law of mass action; K_p, K_c, K_x and K_n; effect of temperature on K; ionic equilibria in solutions; pH and buffer solutions to hydrolysis; solubility product; phase equilibria-phase rule and its application to one-component and two-component systems; colligative properties, etc all are included here.

UNIT IV: Organic Chemistry-1

Solving the IIT-JAM Questions of the years: 2017, 2018 and 2019

UNIT V: Organic Chemistry-II

Solving the IIT-JAM Questions of the years: 2017, 2018 and 2019

Books for Reference

1. Lee, J. D. (1996). *Concise Inorganic Chemistry*, (5th Ed.). Blackwell Science Ltd.
2. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). *Inorganic Chemistry*, (5th Ed.). Pearson Education.
3. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). *Inorganic Chemistry Principles of Structure and Reactivity*, (4th Ed.). Harper Collins College Publishers.
4. March, J. (1992). *Advanced Organic Chemistry*, (4th Ed.). John-Wiley and Sons.
5. Kemp, W. (1987). *Organic Spectroscopy*, (3rd Ed.). ELBS.
6. Clayden, J., Greeves, N., & Warren, S. (2012). *Organic Chemistry*, (2nd Ed.). Oxford University Press.
7. Final, I. L. (1997). *Organic Chemistry Vol I and II*, (6th Ed.). ELBS with Longmann.
8. Laidler, K. J. (1984). *Chemical Kinetics*, (3rd Ed.). TATA McGraw Hill Co.
9. Drago, R. S. (1971). *Physical Methods in Inorganic Chemistry*. East West Press Ltd.
10. Laidler, K. J. (1984). *Chemical Kinetics*, (3rd Ed.). TATA McGraw Hill Co.
11. Kuriacose, J. C., & Rajaram, J. (1993). *Kinetics and Mechanism of Chemical Transformation*. Macmillan & Co.

Course Outcomes		
CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of the course, students will be able to	
CO1	study and understand the periodic table, atomic structure and the organic compounds.	K1
CO2	identify the key factors that influence the outcome of rearrangement reactions	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	apply the bonding theory to the analysis of the structures and reactivity of inorganic compounds.	K5

Relationship Matrix												
Semester	Course Code	Title of the Course									Hours	Credits
6	23UCHCE01	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	2	3	2	1	3	2	3	2	1	2.1	
CO2	2	2	2	2	3	2	2	2	2	3	2.2	
CO3	3	2	3	2	3	3	1	2	2	2	2.3	
CO4	3	2	2	3	2	2	3	1	1	2	2.1	
CO5	2	2	2	2	3	2	3	2	3	2	2.3	
Mean Overall Score											2.2 (Medium)	