B Sc PHYSICS

LOCF SYLLABUS 2023

Department of Physics
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 TANSCHE and other higher educational institutions, facilitates seamless credit transfers across diverse disciplines. This underscores the adaptability and uniqueness of the choice-based credit system.

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

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

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

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

Credit system

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

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

For undergraduate (UG) courses, students are required to accumulate a minimum of 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 course are elective modules that complement the primary disciplines by providing additional knowledge and skills. These courses allow students to explore areas of interest outside their major field of study, broadening their understanding and enhancing their skill set.*

Discipline Specific Elective (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 × 1 = 7
B *(compulsory)*			5					5 × 3 = 15
C *(either…or type)*				3				3 × 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 × 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 × 1 = 10**	**10 × 3 = 30**	**5 × 6 = 30**	**3 × 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
• 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
• Self-paced Learning • Comprehensive Examination	25 + 25 = 50	50 *(CoE)*	100
• Value Education • Environmental Studies	50	50 *(CoE)*	100
• Skill Enhancement Course: Soft Skills	100	-	100
• Generic Elective	100	100 *(CoE)*	100
• 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:

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

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

Where,

Ci - credit earned for the Course i

Gpi - Grade Point obtained for the Course i

Mi - Marks obtained for the Course i

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

WAM - Weighted Average Marks

Classification of Final Results

- For each of the first three parts in the UG Programme, there shall be separate classification on the basis of CGPA, as indicated in Table - 2.
- For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management as Outstanding/Excellent/Very Good/Good/Above Average/Average, the marks and the corresponding CGPA earned by the candidate in Part III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in all the five Parts of the programme.

- Grade in Part IV and Part V shall be shown separately and it shall not be taken into account for classification.
- A pass in SHEPHERD will continue to be mandatory although the marks will not be counted for the calculation of the CGPA.
- Absence from an examination shall not be considered as an attempt.

Table - 1: Grading of the Courses

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

Table - 2: Grading of the Final Performance

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

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

Vision

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

Mission

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

Programme Educational Objectives (PEOs)

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

Programme Outcomes (POs)

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

Programme Specific Objectives (PSOs)

1. Acquire academic excellence with an aptitude for higher studies and research.
2. Gain knowledge about properties of different matter and its application for developing technology to the problems related to the society.
3. Analyse the applications to the problems in Physics through experimental and theoretical means.
4. Acquire the ability to design knowledge and demonstrate their understanding of the scientific methods and processes.
5. Apply appropriate techniques and modern tools to complex scientific activities, and develop skills in communicating Physics-related topics by learning beyond syllabus.

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	10	46	43
	1 - 6	Core Practical	5	24	10
	2	Basic Workshop Practice	1	3	1
	1, 2	Allied Course	2	12	8
	3, 4	Allied Optional	2	8	7
	3, 4	Allied Optional Practical	1	4	1
	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	**49(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	23UPH13CC01	**Core Course - 1:** Properties of Matter and Acoustics	5	4	100	100	100
		23UPH13CP01	**Core Practical - 1:** Properties of Matter and Acoustics	3	2	100	100	100
		23UPH13AC01	**Allied Course - 1:** Mathematics for Physics - 1	6	4	100	100	100
	4	23UPH14FC01	**Foundation Course:** Introductory Physics	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	23UPH23CC02	**Core Course - 2:** Mechanics	5	5	100	100	100
		23UPH23CP02	**Core Practical - 2:** Physics Practical - 2	3	2	100	100	100
		23UPH23WS01	Basic Workshop Practice	3	1	100	-	100
		23UPH23AC02	**Allied Course - 2:** Mathematics for Physics - 2	6	4	100	100	100
	4	23UHE 24VE02	**Value Education - 2:** Fundamental 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	23UPH33CC03	**Core Course - 3:** Mathematical Physics - 1	5	5	100	100	100
		23UPH33CC04	**Core Course - 4:** Electromagnetism	5	5	100	100	100
		@	**Core Practical - 3:** Physics Practical - 3	3	-			
		23UPH33AO01A	**Allied Optional - 1:** Chemistry - 1	4	4	100	100	100
		23UPH33AO01B	**Allied Optional - 1:** Computer Science - 1					
		@	**Allied Optional Practical:** Chemistry Practical	2	-	-	-	-
		@	**Allied Optional Practical:** Computer Science Practical					
	4	23UHE 34VE03A	**Value Education - 3:** Social Ethics - 1*	2	1	50	50	50
		23UHE 34VE03B	**Value Education - 3:** Religious Doctrine - 1*					
		-	Extra Credit Courses (MOOC/Certificate Courses) - 2	-	(3)			
			Total	**30**	**21 (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	23UPH43CC05	**Core Course - 5:** Mathematical Physics - 2	5	4	100	100	100
		23UPH43CC06	**Core Course - 6:** Sound, Thermal and Statistical Physics	5	4	100	100	100
		23UPH43CP03	**Core Practical - 3:** Physics Practical - 3	3	2	100	100	100
		23UPH43AO02A	**Allied Optional - 2:** Chemistry - 2	4	3	100	100	100
		23UPH43AO02B	**Allied Optional - 2:** Computer Science - 2					

		23UPH43OP01A	**Allied Optional Practical:** Chemistry Practical	2	1	100	100	100
		23UPH43OP01B	**Allied Optional Practical:** Computer Science Practical					
	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	**21(3)**			
5	3	23UPH53CC07	**Core Course - 7:** Optics	4	4	100	100	100
		23UPH53CC08	**Core Course - 8:** Concepts of Modern Physics	4	4	100	100	100
		23UPH53CP04	**Core Practical - 4:** Physics Practical - 4	6	2	100	100	100
		23UPH53ES01A	**Discipline Specific Elective - 1:** Analog and Digital Electronics	5	3	100	100	100
		23UPH53ES01B	**Discipline Specific Elective - 1:** Design of Analog and Digital Circuits					
		23UPH53ES02A	**Discipline Specific Elective - 2:** Classical Mechanics	5	3	100	100	100
		23UPH53ES02B	**Discipline Specific Elective - 2:** Solid State Physics					
		23UPH53IS01	Internship	-	1	100	-	100
		23UPH53SP01	**Self-paced Learning:** Astronomy*	-	2	50	50	50
	4	-	**Generic Elective - 1:** Refer ANNEXURE 2	4	2	100	100	100
		23USS54SE01	**Skill Enhance Course - 2:** Soft Skills	2	1	100	-	100
		-	Extra Credit Courses (MOOC/Certificate Courses) - 4	-	(3)			
			Total	**30**	**22(3)**			
6	3	23UPH63CC09	**Core Course - 9:** Quantum Mechanics	4	4	100	100	100
		23UPH63CC10	**Core Course - 10:** Atomic, Nuclear and Particle Physics	4	4	100	100	100
		23UPH63CP05	**Core Practical - 5:** Physics Practical - 5	6	2	100	100	100
		23UPH63ES03A	**Discipline Specific Elective - 3:** Statistical Mechanics	5	3	100	100	100
		23UPH63ES03B	**Discipline Specific Elective - 3:** Spectroscopy and Laser					
		23UPH63ES04A	**Discipline Specific Elective - 4:** Embedded System and Microcontroller	5	3	100	100	100
		23UPH63ES04B	**Discipline Specific Elective - 4:** Sensor, Transducers and IoT					
		23UPH63PW01	Project Work and Viva Voce	-	2	100	100	100
		23UPH63CE01	Comprehensive Examination*	-	2	50	50	50
	4	-	**Generic Elective - 2:** Refer ANNEXURE 3	4	2	100	100	100
		-	**Skill Enhance Course - 3: (WS):** Refer ANNEXURE 4	2	1	100	-	100
		-	Extra Credit Courses (MOOC/Certificate Courses) - 5	-	(3)			
			Total	**30**	**23(3)**			
2 - 5	5	23UCW65OR01	Outreach Programme (SHEPHERD)		4			
1 - 6			**Total (3 years)**	**180**	**133 (15)**			

@ - year end practical

N.B. In the places of * Departments have freedom to distribute this hours for Theory and Practical courses.

*- 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
Chemistry	23UCH14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Role of Chemistry in Daily Life
Electronics	23UEL14SE01	Skill Enhancement Course - 1: (Non-Major Elective): Consumer Electronics

**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
Chemistry	23UCH54EG01	Generic Elective - 1: Health Science
Electronics	23UEL54EG01A	Generic Elective - 1: Everyday Electronics
	23UEL54EG01B	Generic Elective - 1: Wireless Communication

**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
Chemistry	23UCH64EG02	Generic Elective - 2: Solid Waste Management
Electronics	23UEL64EG02A	Generic Elective - 2: CCTV and Smart Security Systems
	23UEL64EG02B	Generic Elective - 2: Entrepreneurial Electronics

**Offered to students from other Departments*

ANNEXURE 4
Skill Enhancement Course - 3 (WS)*

School	Course Code	Title of the Course
SPS	23UCH64SE02	Skill Enhancement Course - 3 (WS): Instrumental Analysis
	23UEL64SE02A	Skill Enhancement Course - 3 (WS): Lab Equipment Maintenance and Servicing
	23UEL64SE02B	Skill Enhancement Course - 3 (WS): PC Assembling and Servicing

**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-பதினெண்கீழ்கணக்கு 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 - சுடர்த்தொடீஇக் 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 திருவாசகம் - நமச்சிவாய வாஅழ்க நாதன்தாள் 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)*

பாடநூல்

1. **பொதுத்தமிழ்***-1 (* **தமிழ் இலக்கிய வரலாறு***-1),* **தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி** *– 620 002,* **முதற்பதிப்பு** *- 2023*

பார்வை நூல்கள்

2. *வரதராசன்.மு., தமிழ் இலக்கிய வரலாறு, சாகித்ய அக்காதெமி, புதுடெல்லி. 2021*
3. *விமலானந்தன். மது. ச., தமிழ் இலக்கிய வரலாறு, முல்லை நிலையம், சென்னை, 2019*
4. *தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, பாரி நிலையம், சென்னை, 2022*
5. *சிற்பி பாலசுப்பிரமணியன் & சேதுபதி.சொ., தமிழ் இலக்கிய வரலாறு, கவிதா வெளியீடு, சென்னை, 2015*
6. *சிற்பி பாலசுப்ரமணியம், & பத்மநாபன். நீல., புதிய தமிழ் இலக்கிய வரலாறு (3 தொகுதிகள்), சாகித்ய அக்காதெமி, புதுடெல்லி,2013*
7. *பெருமாள். அ.கா., தமிழ் இலக்கிய வரலாறு, சுதர்சன் புக்ஸ், நாகர்கோவில், 2014*
8. *ஏசுதாசன். ப.ச., தமிழ் இலக்கிய வரலாறு, நியூ செஞ்சுரி புக் ஹவுஸ்,சென்னை, 2015*
9. *ஸ்ரீகுமார். எஸ்., தமிழ் இலக்கிய வரலாறு, ஸ்ரீசெண்பகா பதிப்பகம், சென்னை, 2014*
10. *பாக்கியமேரி எஃப்., வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, பூவேந்தன் பதிப்பகம், சென்னை,*2022
11. *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** ***இப்பாடத்தின் நிறைவில் மாணவர்கள்***	**Cognitive Levels (K - Level)**
CO1	*சங்க இலக்கியங்கள்வழி பண்டைத்தமிழரின் வாழ்வியலையும் பண்பாட்டையும் அறிந்து கொள்வர்*	**K1**
CO2	*அற இலக்கியங்கள், காப்பியங்கள் வெளிப்படுத்தும் அறம்சார் விழுமியங்களைத் தம் வாழ்வில் பின்பற்றுவர்*	**K2**
CO3	*இலக்கணக் கோட்பாடுகளை இக்கால வாழ்வியலோடு பொருத்திப் பார்ப்பர்*	**K3**
CO4	*மொழியறிவோடு பெறுவர் திறன் பகுத்தாராயும் இலக்கியங்களைப்*	**K4**
CO5	*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**	**PSO 1**	**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
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

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 A1*, Didier, Paris 2020.
2. J.Girardet and J.Pecheur, *Echo A1*, CLE International, 2^{e}edition ,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://francais.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/exercises/exercise-french-2/exercise-french-3295.php

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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 priksha par adharit nibandho dwara bhasha ki kshamta badhane vale prashikshan kary.

Teaching Methodology	Videos, PPT, Quiz, Group Discussion, Project Work.

Books for Study

1. Gupth, 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** On successful completion of the course, the student will be able to	**Cognitive Levels (K - Level)**
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 toPancamahakavyas.
To understand the Raghuvasa Mahakava and Kalidasa.

UNIT I **(15 Hours)**

Introduction to Sanskrit (Alphabets, Two letter words and three letter words)

Grammar:

akārāntaḥpuṁliṅgaḥśabda-s - 1. बाल (*Bāla*) and 2. देव (*Deva*) *ākārāntaḥstrīliṅgaḥśabda-s* - 1. बाला (*Bālā*) and 2. लता (*Latā*)*akārāntaḥnapuṁsakaliṅgaḥśabda-s* -

1. फल (*Phala*) and 2. वन (*Vana*)

UNIT II **(15 Hours)**

Introduction to *Rāmāyana,Kālidāsa* and his poetic works

Text: *Raghuvaṁśa* (Canto I) Verses 1-15

UNIT III **(15 Hours)**

Introduction to the works of *Bhāravi* -

Text: *Raghuvaṁśa* (canto I) Verses 16-30

UNIT IV **(15 Hours)**

Introduction to the works of *ŚrīHarṣha* -

Text: *Raghuvaṁśa* (Canto I) Verses 31-45

UNIT V **(15 Hours)**

Grammar:

Conjugations -*Laṭlakāra-s* – (Present tense)

(i) गच्छतत (*Gacchati*) (ii) ततष्ठतत (*Tiṣṭhati*) (iii) पठतत (*Paṭhati*)

(iv) नृत्यतत (*Nṛtyati*) (v) कु प्यतत (*Kupyati*) (vi) कथयतत (*Kathayati*)

(vii) गणयतत (*Gaṇayati*) (viii) अततत (*Asti*)

(ix) करोतत (*Karoti*) (x) शृणोतत (*Śṛṇoti*)

Indeclinables (Avyayaani) - अतप (*api*), कदा (*kadā*), च (*ca*), अद्य (*adya*), तवना (*vinā*),सह (*saha*), तत्र (*tatra*), ककम् (*kim*), यकद (*yadi*) - तर्ह (*tarhi*), यथा (*yathā*) - तथा (*tathā*) Prefixes (*Upasargas*) - आङ् (*āṅ*), तव (*vi*), परर (*pari*), अनु (*anu*),

अति (*adhi*), उत् (*ut*), प्रतत (*prati*), उप (*upa*), प्र (*pra*) तनर् (*nir*)

Teaching Methodology	Videos, PPT, demonstration.

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/AShortHistoryOfsanskritLiterarure
5. https://archive.org/details/raghuvamsha_with_sanjivini_edited_by_mr_kale

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	remember the usage of grammatical tenses inconstructing 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 hypothesisin 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

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

Poem

3. Where the Mind is Without Fear – Gitanjali 35 – Rabindranath Tagore
4. Love Cycle – Chinua Achebe

UNIT II: Empathy (15 Hours)

Poem

5. Nine Gold Medals – David Roth
6. Alice Fell or poverty – William Wordsworth

Short Story

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

UNIT III: Parts of Speech (15 Hours)

9. Articles
10. Noun
11. Pronoun
12. Verb
13. Adverb
14. Adjective
15. Preposition

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

Poem

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

Readers Theatre

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

Unit V: Paragraph and Essay Writing (15 Hours)

20. Descriptive
21. Expository
22. Persuasive
23. Narrative
24. Reading Comprehension

Teaching Methodology	Interactive methods, and multimedia presentations

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/9rVzlNv
5. https://archive.org/details/in.ernet.dli.2015.44179

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	23UPH13CC01	**Core Course - 1**: Properties of Matter and Acoustics	5	4

Course Objectives
To Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers
To inform about the internal forces which act between the constituent parts of the substance
To provide students an insight of the principles of waves and oscillation and their characteristics
To understand the physics of acoustics of a building and methods of production of ultrasonic waves
To understand the properties of matter and apply the concepts in practical applications

UNIT I: Elasticity **(15 Hours)**

Hooke's law - stress-strain diagram - elastic constants -Poisson's ratio - relation between elastic constants and Poisson's ratio - work done in stretching and twisting a wire - twisting couple on a cylinder - rigidity modulus by static torsion- torsional pendulum (with and without masses)

UNIT II: Bending of Beams **(15 Hours)**

cantilever- expression for Bending moment - expression for depression at the loaded end of the cantilever- oscillations of a cantilever - expression for time period - experiment to find Young's modulus - non-uniform bending- experiment to determine Young's modulus by Koenig's method - uniform bending - expression for elevation - experiment to determine Young's modulus using microscope

UNIT III: Fluid Dynamics **(15 Hours)**

Surface tension: definition - molecular forces- excess pressure over curved surface - application to spherical and cylindrical drops and bubbles - determination of surface tension by Jaegar's method- variation of surface tension with temperature *Viscosity*: definition - streamline and turbulent flow - rate of flow of liquid in capillary tube - Poiseuille's formula -corrections - terminal velocity and Stoke's formula- variation of viscosity with temperature

UNIT IV: Waves and Oscillations **(15 Hours)**

Simple Harmonic Motion (SHM) - differential equation of SHM - graphical representation of SHM - composition of two SHM in a straight line and at right angles - Lissajous's figures- free, damped, forced vibrations -resonance and Sharpness of resonance. Laws of transverse vibration in strings -sonometer - determination of AC frequency using sonometer-determination of frequency using Melde's string apparatus.

UNIT V: Acoustics of Buildings and Ultrasonics **(15 Hours)**

Intensity of sound - decibel - loudness of sound -reverberation - Sabine's reve rberation formula - acoustic intensity - factors affecting the acoustics of buildings.*Ultrasonic waves*: production of ultrasonic waves - Piezoelectric crystal method - magnetostriction effect - application of ultrasonic waves.

Teaching Methodology	Black board teaching, Video lectures, Demonstrations with models, Handouts

Books for Study

1. Mathur, D. S. (2007). *Elements of Properties of matter*, (1st Ed.). S. Chand & Company.
2. Brij, L., & Subrahmanyam, N. (2003). *Properties of matter*, (1st Ed.). S. Chand & Company.
3. Khanna, D. R., & Bedi, R. S. (1969). *Textbook of sound*. AtmaRam & sons.
4. Brij., & Subrahmanyam, N. (1995). *A Text Book of sound*. Vikas Publishing House.
5. Murugesan, R. (2012). *Properties of matter*. S.Chand & Company.

Books for Reference

1. Smith, C. J. (1960). *General properties of matter*, (1st ed.). Orient Longman Publishers.
2. Gulati, H. R. (1977). *Fundamental of general properties of matter*, (5th Ed.). R. Chand & Company.
3. French, A. P. (1973). *Vibration and waves*. MIT Introductory Physics, Arnold Heinman.

Websites and eLearning Sources

1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3. https://www.youtube.com/watch?v=gT8Nth9NWPM
4. https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s
5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7. http://www.sound-physics.com/
8. http://nptel.ac.in/courses/112104026/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	acquire the knowledge on elastic moduli, elasticity and viscosity of liquids and gases, molecular theory of surface tension, diffusion, osmosis, acoustics of building and ultrasonics	**K1**
CO2	understand the concepts of elasticity, viscosity and surface tension in real situations, the diffusion in liquids, the methods of production of ultrasonic waves	**K2**
CO3	apply the knowledge to find the bending of beams, and to determine the molecular forces and excess pressure over curved surface	**K3**
CO4	apply the knowledge to determine the young modulus by Koenig's method and produce ultrasonic waves using piezoelectric crystal method	**K4**
CO5	analyze the bending moments in beams, flow of liquids in capillary tubes, surface tension of liquid versus temperature, different types of oscillations and factors affecting the acoustics of building	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**23UPH13CC01**			**Core Course - 1**: Properties of Matter and Acoustics						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**	
CO1	2	3	3	2	2	2	3	2	2	2	**2.3**
CO2	3	2	2	2	2	2	3	2	2	2	**2.2**
CO3	2	3	2	2	2	2	2	2	2	2	**2.1**
CO4	2	2	3	2	2	2	2	2	2	2	**2.1**
CO5	2	2	2	3	2	2	2	3	3	2	**2.3**
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/ Week	Credits
1	23UPH13CP01	**Core Practical - 1**: Properties of Matter and Acoustics	3	2

Any 12 Experiments

1. Determination of rigidity modulus without mass using Torsional pendulum
2. Determination of rigidity modulus with masses using Torsional pendulum
3. Determination of moment of inertia of an irregular body
4. Verification of parallel axes theorem on moment of inertia
5. Verification of perpendicular axes theorem on moment of inertia
6. Determination of moment of inertia and g using Bifilar pendulum
7. Determination of Young's modulus by stretching of wire with known masses
8. Verification of Hook's law by stretching of wire method
9. Determination of Young's modulus by uniform bending - load depression graph
10. Determination of Young's modulus by non-uniform bending - scale and telescope
11. Determination of Young's modulus by cantilever - load depression graph
12. Determination of Young's modulus by cantilever - oscillation method
13. Determination of Young's modulus by Koenig's method - (or unknown load)
14. Determination of rigidity modulus by static torsion
15. Determination of Y, n and K by Searle's double bar method
16. Determination of surface tension and interfacial surface tension by drop weight method
17. Determination of co-efficient of viscosity by Stokes' method - terminal velocity
18. Determination of critical pressure for streamline flow
19. Determination of Poisson's ratio of rubber tube
20. Determination of viscosity by Poiseullie's flow method
21. Determination radius of capillary tube by mercury pellet method
22. Determination of g using compound pendulum.

Semester	Course code	Title of the Course	Hours/Week	Credits
1	23UPH13AC01	**Allied Course - 1:** Mathematics for Physics - 1	6	4

Course Objectives
To train the students to use their basic skills of differentiation for successive differentiation
To have knowledge on integration and its properties
To know the methods of solving differential equations
To explore the basic ideas of matrices
To understand the nature of series

UNIT I **(18 Hours)**

Higher Derivatives – Trigonometrical Transformation – Formation of Equation Involving Derivatives – Leibnitz's Formula for the nth Derivatives of a Product (Without Proofs)

UNIT II **(18 Hours)**

Properties of Definite Integrals - Integration by Parts - Reduction Formula for $x^n e^{ax}$, $x^n \cos ax$, $x^n \sin ax$, $\sin^n x$, $\cos_n x$, $\sin^m x \cos_n x$ and $\tan^n x$.

UNIT III **(18 Hours)**

First Order Differential Equations - Variable Separable - Homogenous Equations- NonHomogenous Equations - Linear Equation - Bernoulli's Equation-Second Order Differential Equations - Linear Equation with Constant Coefficients.

UNIT IV **(18 Hours)**

Matrices - Rank of a Matrix - Solving Simultaneous Linear Equations in Three Unknowns Using Elementary Operations Method - Eigen Values and Eigen Vectors - Verification of Cayley Hamilton Theorem.

UNIT V **(18 Hours)**

Concept of Limit of a Sequence - Limit of a Function - Simple Problems -Convergence, Divergence and Oscillation of a Series - Geometric Series -Tests of Convergence and Divergence, Comparison Test, Ratio Test and Root Test (Without Proofs).

Teaching Methodology	Lectures, Demonstrations

Books for Study

1. Narayanan, S., Rao, R. H., Pillay, T. K. M., & Kandaswamy. (2009). *Ancillary mathematics, Vol-I*. Viswanathan, S., Printers & Publishers Pvt Ltd.
   Unit I: Chapter 6 – Sec 6.1, pp: 266-281
   Unit IV: Chapter 3 – Sec 3.2 - 3.4, pp: 137-160.
2. Narayanan, S., Rao, R. H., Pillay, T. K. M. & Kandaswamy. (2010). Ancillary mathematics, Vol-II. Viswanathan, S., Printers & Publishers Pvt Ltd.
   Unit II: Chapter 1 – Sec 11, Sec 12, pp: 68-72 , Sec 13.1-13.6, pp: 61-67, 73-82.
3. Narayanan, S. & Pillay, T. K. M. (2001). *Differential equations and its applications*. Viswanathan, S., Printers & Publishers Pvt Ltd.
   Unit III: Chapter 2- Sec 1-5, pp.7-19, Chapter 5- Sec 1-4, pp: 68-88.
4. Venkataraman, M. K. (1986). *Higher mathematics for engineering and science,* (3rd Ed.). The National Publishing Company, Madras.
   Unit V: Chapter 6 – Sec 1-14.

Book for Reference

1. Narayanan, S., & Pillay, T. K. M. (1999), *Ancillary mathematics, Book II*. Viswanathan, S., Printers & Publishers Pvt Ltd.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	attain knowledge of higher derivatives, definite integrals, first and second order differential equations, matrices and infinite series.	**K1**
CO2	understand formation of equations involving derivatives, trigonometrical transformation in derivatives, properties of definite integrals operations and properties of matrices and convergence of series.	**K2**
CO3	illustrate integration by parts, reduction formula, simultaneous linear equations in three unknowns, different methods in first order differential equations and convergence of series.	**K3**
CO4	verify integration by parts, Leibnitz's formula, reduction formula, linear equation, Bernoulli's equation, Cayley Hamilton theorem and comparison test, ratio test and root test.	**K4**
CO5	evaluate definite integrals, reduction formula, solutions of first and second order differential equations, rank of a matrix eigenvalues and eigenvectors and convergence.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
1	**23UPH13AC01**	**Allied Course - 1:** Mathematics for Physics - 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**	**PSO 5**	
CO1	3	3	3	2	2	1	2	3	1	2	**2.2**
CO2	3	2	2	3	3	3	3	2	2	3	**2.6**
CO3	2	2	2	3	2	3	3	3	2	3	**2.5**
CO4	2	2	1	1	2	2	3	2	2	2	**1.9**
CO5	2	1	2	1	2	2	3	2	2	3	**2**
Mean Overall Score											**2.24 (High)**

Semester	Course Code	Title of the Course	Hours/ Week	Credits
1	23UPH14FC01	**Foundation Course**: Introductory Physics	2	1

Course Objectives
To help students get an overview of Physics before learning their core courses
To serve as a bridge between the school curriculum and the degree programme
To know the basics of vectors and types of forces
To understand the concepts of momentum, energy conservation and the dynamics of various systems
To know the foundations of properties of matter

UNIT I: Introduction to Vectors **(6 Hours)**

Vectors, scalars -examples for scalars and vectors from physical quantities - addition, subtraction of vectors - resolution and resultant of vectors - units and dimensions- standard physics constants

UNIT II: Types of Forces **(6 Hours)**

Types of forces-gravitational, electrostatic, magnetic, electromagnetic, nuclear -mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces

UNIT III: Momentum and Energy Conservation **(6 Hours)**

Different forms of energy - conservation laws of momentum, energy - types of collisions - angular momentum- alternate energy sources-real life examples

UNIT IV: Dynamics **(6 Hours)**

Types of motion - linear, projectile, circular, angular, simple harmonic motions - satellite motion - banking of a curved roads - stream line and turbulent mot ions - wave motion - comparison of light and sound waves - free, forced, damped oscillations

UNIT V: Properties of Matter **(6 Hours)**

Surface tension - shape of liquid drop - angle of contact - viscosity -lubricants - capillary flow - diffusion - real life examples- properties and types of materials in daily use- conductors, insulators - thermal and electric

Teaching Methodology	Chalk and talk, PPT, Pictorial models, Experimental and Graphical representation using software, simulation.

Books for Study

1. Verma, H. C. (2021). *Concepts of physics.* Vol 1 and 1st Edition, Bharati Bhawan (Publishers & Distributors).
2. Mathur, D. S. (2007). *Elements of properties of matter,* (1st Ed.). S. Chand & Company.
3. Brij, L., & Subrahmanyam, N. (2003). *Properties of matter,* (1st Ed.). S. Chand & Company.

Books for Reference

1. Gulati, H. R. (1977). *Fundamental of general properties of matter,* (5th Ed.). S. Chand & Company.
2. Young, H. D., Freedman, R. A., & Ford, A. L. (2021). *University physics with modern physics,* (15th Ed.). Pearsons Education.
3. Halliday, D., Resnick, R., & Walker, J. (2010). *Fundamentals of physics,* (9th Ed.). Wiley.

Websites and eLearning Sources

1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
2. https://science.nasa.gov/ems/
3. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	recall and relate various concepts of elementary physics.	**K1**
CO2	summarize and translate statics and dynamics phenomena in physics and bridge the introduction from school physics to a graduate level.	**K2**
CO3	apply the concept of all the above mentioned and develop various other concept of physics in matter and nature. Also, interpret the mathematical theory behind various physics.	**K3**
CO4	on the successful completion of the course, student will be able to	**K4**
CO5	recall and relate various concepts of elementary physics.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**23UPH14FC01**			**Foundation Course**: Introductory Physics						**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	2	2	1	3	3	3	2	2	**2.4**
CO2	3	3	3	2	2	3	3	3	2	2	**2.5**
CO3	3	3	3	2	2	3	3	3	2	2	**2.5**
CO4	3	3	2	2	1	3	3	3	2	2	**2.4**
CO5	3	3	3	2	2	3	3	3	2	2	**2.5**
										Mean Overall Score	**2.46 (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 - Crimens against Women - Women rights - Time-line of Women achievements in India

Teaching Methodology	Chalk and Talk, Power point

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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**	**PSO 4**	**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

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

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

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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 பர்வதத்தின் சாரல்
நற்றமிழ்க்கோவை – முதல் மூன்று கட்டுரைகள்

அலகு - 2 ***(12 மணிநேரம்)***

வெ.இராமலிங்கனார் – சொல், தமிழன் இதயம்
முடியரசனார் – உயிர் வெல்லமோ, மனத்தூய்மை
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 பானையின் 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 என்தாய் மண்ணே
ஹைபுன் கவிதைகள்
சிறுகதை – நான்கு முதல் ஆறு சிறுகதைகள்
நற்றமிழ்க் கோவை – நான்கு முதல்ஆறு கட்டுரைகள்

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

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** ***இப்பாடத்தின் நிறைவில் மாணவர்கள்***	**Cognitive Levels (K - Level)**
CO1	***தமிழ் இலக்கிய நூல்கள் பற்றிய அறிவைப் பெறுவர்.***	**K1**
CO2	***தமிழ் இலக்கண வளர்ச்சியைப் புரிந்து கொள்வர்.***	**K2**
CO3	***பிழையின்றி எழுதும் திறன் பெறுவதோடு கற்றல் 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

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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

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://viahindi.in/hindi-vyakaran/sandhi-paribhasha-prakar-or-udaharan

Course Outcomes		
CO No.	**CO-Statements** On successful completion of the course, the student will be able to	**Cognitive Levels (K - Level)**
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

Books for Study

1. Saralasamkritham 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 On successful completion of this course, students will be able to	Cognitive Levels (K - Level)
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. Humourous 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

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	23UPH23CC02	**Core Couse - 2:** Mechanics	5	5

Course Objectives
To know the fundamentals of kinematics and dynamics of an object in different coordinate systems.
To understand the techniques for studying motion of an object in different systems
To apply the fundamental concepts of vector for solving complex problems in mechanics.
To identify the relation between velocity, acceleration, force and momentum for different physical systems and solving the problems related to conservation laws.
To analyse the concepts of the different forces acting on various physical systems.

UNIT I: Kinematics and Dynamics **(15 Hours)**

Kinematic equation - plane polar coordinates-circular motion and straight line motion - velocity and acceleration of a bead on a spoke - Newton's laws - Astronauts in space - applications of Newton's laws - astronaut's tug of war, Freight train - Constraints - wedge and block - masses and pulley - pulley system - Block on strings - The whirling rope - contact forces - block and string - Dangling rope - pulleys - tension and atomic forces - normal force and friction- block and wedge with friction.

UNIT II: Momentum **(15 Hours)**

System of particles - Bola, center of mass - drum major's baton, non-uniform rod, triangular sheet, conservation of momentum - Three body system, impulse -rubber ball rebound, force of impact with ground, flow of mass- spacecraft, freight car, rocket in free space and gravitational field, momentum transport to the surface.

UNIT III: Work and Energy **(15 Hours)**

Equation of motion in one dimension - mass thrown upward, simple harmonic oscillator - work energy theorem in one dimension - Vertical motion in an inverse square field - work energy theorem - escape velocity, Applying the work energy theorem - inverted pendulum- work done by a uniform force and central force - Potential energy - uniform force field, inverse square field - Energy diagrams - Non Conservative forces.

UNIT IV: Rotational Dynamics **(15 Hours)**

Angular Momentum - Particle, Sliding block and Conical pendulum, Torque - Sliding block and Conical pendulum, Fixed axis rotation, Moments of Inertia - uniform thin ring - uniform thin rod - circular disc, rotations about fixed axis, Atwood's machine, motion involving both translation and rotation - rolling wheel, disc on ice and drum rolling down a plane.

UNIT V: Gravitation and Central Force Motion **(15 Hours)**

Gravitational force, Potential energy and gravitational force due to spherical shell and solid sphere - Gravitational energy of a uniform sphere - Radius of an electron - Kepler's laws - Two body problem: Reduced mass.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Books for Study

1. Kleppner., & Kolenkow. (2017). *An introduction to Mechanics*, (1st Ed.). McGraw-Hill.
2. Kittel, C., Knight, W., Helmholtz., Ruderman., & Moyer. (2017). *Mechanics*, (2nd Ed.). McGraw-Hill.

UNIT	BOOK	SECTIONS
I	1	1.7-1.9, 2.2, 2.4
II	1	3.1-3.6
III	1	4.2, 4.3, 4.5-4.7, 4.9, 4.11
IV	1	6.2-6.7
V	2	Ch 9 - P.No. 271-775, 276-279, 286-292

Books for Reference

1. Robert, R., Halliday, D., & Walker, J. (2015). *Principles of Physics*, (10th Ed.). John Wiley.
2. Feynman, R.P. (2012). *The Feynman lectures on Physics*, Pearson.
3. Irodov, I. E. (2016). *Problems in general Physics*, Arihant Publishers.

Websites and eLearning Sources*

1. https://www.youtube.com/@leokap
2. https://www.youtube.com/playlist?list=PLVOAwPuFGgdB4BvIJWAO_eq4uyAfNUdp4

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

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire the knowledge on the concepts of kinematics and dynamics for the application of physics in real life physical problems.	**K1**
CO2	understand the concepts of motion for solving the problems related to conservation laws and rigid body dynamics.	**K2**
CO3	apply laws of motion and gravitation for understanding the complex problems in physics.	**K3**
CO4	analyze the relations between velocity, acceleration, force and momentum for different physical systems.	**K4**
CO5	evaluate the forces acting on various physics systems and problems related to conservation laws.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
2	**23UPH23CC02**			**Core Couse - 2:** Mechanics					**5**		**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	1	3	3	3	2	1	**2.3**
CO2	3	2	3	2	1	3	3	2	3	1	**2.3**
CO3	3	3	2	2	2	3	3	2	1	1	**2.2**
CO4	3	3	2	3	1	3	3	3	2	1	**2.4**
CO5	3	3	*3*	2	1	3	3	2	2	1	**2.3**
									Mean Overall Score		**2.3(High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UPH23CP02	**Core Practical - 2:** Physics Practical - 2	3	2

Any 12 Experiments

1. Sonometer - frequency of the tuning fork - RD of solid.
2. Sonometer - AC frequency determination.
3. Spectrometer - refractive index - solid prism (glass).
4. Spectrometer - dispersive power - prism.
5. Potentiometer - internal resistance.
6. Potentiometer - low range voltmeter.
7. P.O Box - temperature coefficient.
8. Carey Fosters bridge - R and ρ (rho).
9. Convex lens - f, R and μ.
10. Concave lens - f, R and μ.
11. Field along the axis of a coil - deflection magnetometer.
12. M1/M2- Tan A & Tan B simultaneous method.
13. M1/M2 - Vibration magnetometer.
14. Air wedge -Thickness of wire.
15. Newton's rings.
16. B.G. - Figure of merit.
17. B.G. comparison of EMF's and capacitance.
18. Resonators - Helmholtz and Cylindrical Resonators.
19. g - by fall plate.
20. Specific heat by cooling method.
21. Specific heat capacity of solid by the method of mixture.

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	**23UPH23WS01**	Basic Workshop Practice	**3**	**1**

1. Paper Weight
2. Pen Stand
3. Letter box
4. Wood Carving
5. Electroplating
6. Assembling the Extension board
7. Tube light assembling.
8. LED light assembling

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23UPH23AC02	**Allied Course - 2:** Mathematics for Physics - 2	6	4

Course Objectives
To have knowledge on various numerical methods.
To have knowledge on solving partial differential equations.
To explore the knowledge on vector calculus in terms of Gradient - Divergence and Curl.
To have knowledge on expansion of trigonometry functions and hyperbolic functions.
To understand the concept of analytic functions.

UNIT I **(18 Hours)**

Simultaneous Linear Algebraic Equations - Gauss Elimination Method - Iteration Method: Gauss Seidel Method -Numerical Solution of O.D.E - Solution by Taylor's Methods - Euler's Method – Runge - Kutta Method (4th Order).

UNIT II **(18 Hours)**

Derivation of partial differential equations - By Elimination of Arbitrary Functions - Different Integrals of partial differential equations - Standard type of First Order Equations - Lagrange's Equation.

UNIT III **(18 Hours)**

Gradient - Divergence and Curl - Gauss Divergence Theorem - Green Theorem - Stokes Theorem (No proofs of theorem, only simple applications).

UNIT IV **(18 Hours)**

Expansion of $\sin n\theta$ and $\cos n\theta$ - Powers of Sines and Cosines of θ in terms of function of multiple of θ - Hyperbolic Functions - Inverse Hyperbolic Functions.

UNIT V **(18 Hours)**

Analytic function - Cauchy Riemann equations (No derivation, only simple applications) - Residues - Evaluation of definite integrals (Integral over the unit circle only).

Teaching Methodology	Lectures, Demonstrations.

Books for Study

1. Venkataraman, M.K. (2013). *Numerical Methods in Science and Engineering***.** The National Publishing Company, (5th Ed.).
   UNIT I: *Chapter IV (Sec: 2, 6), Chapter XI (Sec: 6, 10, 16).*
2. Narayanan,S., Rao, H.R., Pillay, T.K.M., & Kandaswamy. (2010). *Ancillary Mathematics Vol-II.*
   UNIT II: *Chapter 6 - Sec 1-6, pp: 252-274.*
   UNIT III: *Chapter 8 - Sec 1.16-1.20, 6, 7 and 9, pp: 335-350, 381-392, 399-405.*
3. Narayanan,S., Rao, H.R., Pillay, T.K.M., & Kandaswamy. (2009). *Ancillary Mathematics Vol-I.*
   UNIT IV: *Chapter 5 - Sec 5.1, 5.2 and 5.4, pp: 220-232, 242-256.*
4. Narayanan,S., Pillay, T.K.M. (1997). *Complex Analysis.*
   UNIT V: *Chapter 1 - Sec 11, pp: 43-57, Chapter 5 - Sec 1-3, (pp: 185-196).*

Books for Reference

1. Narayanan,S., Pillay, T.K.M. (2013). *Differential equations and its applications.* Viswanathan Pvt Ltd.
2. Venkataraman, M. K. (1986). *Higher Mathematics for Engineering and Science*, (3rd Ed.). The National Publishing Co.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	have knowledge of basic concepts of numerical methods, partial differential equations, vector analysis, trigonometry and complex analysis.	**K1**
CO2	understand numerical methods, curl and divergence of a vector function, types of PDEs, series expansion, analyticity of a function.	**K2**
CO3	apply various methods in solving problems.	**K3**
CO4	illustrate with suitable examples.	**K4**
CO5	evaluate numerical solutions of ODE by numerical methods, PDEs, line, surface and volume integrals, series expansion, complex integration.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**23UPH23AC02**			**Allied Course - 2:** Mathematics for Physics - 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	2	3	2	1	3	3	1	2	3	**2.3**
CO2	3	3	2	1	2	3	3	2	2	2	**2.3**
CO3	3	2	3	1	2	2	3	2	3	2	**2.3**
CO4	3	2	3	1	2	3	2	1	2	3	**2.2**
CO5	3	3	3	2	2	2	3	1	2	3	**2.4**
										Mean Overall Score	**2.3 (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

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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)***

ஔவையார்
காவிரியே தார்வேந்தன் (16) **கற்றது கைமண்ணளவு** *(39)* **மதியாதார் முற்றம்** *(42)*
இனியது கேட்கின் *(55)* **தாயொடு அறுசுவை** *(64)*
காளமேகப் புலவர் -
நஞ்சிருக்குத் தோலுரிக்கு நாதர்முடி*(4)* **ஓடுஞ் சுழிசுத்த முண்டமாகும்** *(16)*
அடிநந்தி சேர்தலால் ஆகம் *(22)* **செருப்புக்கு வீரரைச் சென்றுழக்கும்** *(52)*
துதிவாணி வீரம் *(80)*
இராமச்சந்திர கவிராயர் – **வஞ்சகர்பா னடந்தலைந்த** - *19*
பொற்களந்தைப் படிக்காசுத் தம்பிரான் – **குட்டுதற்கோபிள்ளைப் பாண்டிய** - *21*
தமிழ்விடுதூது,- கண்ணிகள் *19* **முதல்** *62* **வரை**
கலிங்கத்துப்பரணி -தேவியைப் பரவியது, பாடல் *121* **முதல்** *134* **வரை**

அலகு - 2 ***(12 மணி நேரம்)***

முக்கூடற்பள்ளு –நாட்டுப்படலம் பாடல்கள் *19* –முதல் *27* வரை
முத்துகுமாரசாமி பிள்ளைத்தமிழ் – அம்புலிப்பருவம் முதல் *5* பாடல்கள்
அறிஞர் அண்ணா – வேலைக்காரி நாடகம்

அலகு - 3 ***(12 மணி நேரம்)***

திருக்குற்றாலக்குறவஞ்சி – 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)*

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** ***இப்பாடத்தின் நிறைவில் மாணவர்கள்***	**Cognitive Levels (K - Level)**
CO1	***இடைக்காலப் புலவர்களின் பாட்டுதிதிறனை அறிந்து கொள்வர்***	**K1**
CO2	***சிற்றிலக்கிய வகைகளையும் வகைமைகளையும் அறிந்து கொள்வர்***	**K2**
CO3	***பள்ளு, பரணி, பிள்ளைத்தமிழ், குறவஞ்சி போன்ற இலக்கியங்கள் வழி வீரம், பக்தி, காதல் உணர்வை அறிந்து கொள்வர்***	**K3**
CO4	***சிற்றிலக்கியங்களின்அமைப்பு 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

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

Websites and eLearning Sources

1. https://francais.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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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 Khooon
- 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

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** On successful completion of the course, the student will able to	**Cognitive Levels (K - Level)**
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

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.learnsanskrit.org/guide/uninflected-words/the-upasarga/

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

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** On completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	23UPH33CC03	**Core Course - 3:** Mathematical Physics - 1	5	5

Course Objectives
To know the fundamental concepts and theorems in vector calculus, multiple integrals and differential equation.
To understand the results and effects of various concepts in differential equations, differential and integral calculus.
To apply the basic principles of differential equations, vectors calculus and multiple integrals on various physics problems.
To solve various physics problems using the mathematical tools.
To analyze and investigate various physical systems using the mathematical theory.

UNIT I: Vectors Differential Calculus **(15 Hours)**

Vector function - Differentiation of vectors - Formulae of differentiation - Scalar and Vector point functions - Gradient of scalar function - Geometrical meaning of gradient - Normal and directional derivative - Divergence of vector function - Physical interpretation of divergence - Curl - Physical meaning of curl.

UNIT II: Vectors Integral Calculus **(15 Hours)**

Line integral - Surface integral - Volume integral - Green's theorem: plane - area of plane - Stoke's theorem (relation between line and surface integral) - verification- Gauss's theorem of divergence - deductions from Gauss divergence theorem.

UNIT III: Multiple Integrals **(15 Hours)**

Double Integral: Curvilinear and cylindrical coordinate system - Evaluation - Applications: Area in cartesian and polar coordinates - volume of a solid by rotation - centre of gravity. Triple Integrals: Cartesian, cylindrical and spherical coordinate system - Evaluation - Applications: Volume of solid bounder by sphere of cylinder and cone- Mass - Moment of inertia.

UNIT IV: First Order Differential Equation **(15 Hours)**

Introduction - Formation of differential equations - solution of a differential equation Geometrical meaning - first order differential equation - variables separable - homogenous differential equations - linear differential equations- electrical circuits - solving ODE for current - LR & CR circuits - rectilinear motion.

UNIT V: Second Order Differential Equation **(15 Hours)**

Nonlinear differential equations - second order differential equations - homogeneous and non-homogeneous equations- fundamental theorem for homogenous differential equation - complementary function - particular integral - damped LCR circuit - vertical motion - vertical and horizontal elastic strings- simple harmonic motion.

Teaching Methodology	Lectures, Presentations, Simulations, and Videos

Book for Study

1. Dass, H. K. (2014). *Mathematical Physics*, (7th Revised Ed.). S. Chand.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.14
II	1	3	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8, 3.9
III	1	4,5,6,7,8	4.1, 4.8, 5.1, 5.2, 6.2, 6.5,7.1, 7.2, 8.2, 8.3, 8.4, 8.7, 8.9
IV	1	12, 17	12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.10, 17.2, 17.4
V	1	13, 17	13.2, 13.3, 13.5, 13.6, 13.7, 13.14, 13.15, 13.22, 17.2, 17.3, 17.4, 17.6, 17.7, 17.8

Books for Reference

1. Kreyszig, E. (2010). *Advanced Engineering Mathematics*, (9th Ed.). Wiley.

2. Griffiths, D. J. (2018). *Introduction to Electrodynamics*, (4th Ed.). Pearson.
3. Weber, H., & Arfken, G. (2003). *Essential Mathematical Methods for Physicists*, (1st Ed.). Elsevier.
4. Riley, K., Hobson, M., & Bence, S. (2006). *Mathematical Methods for Physics and Engineering: A Comprehensive Guide*, (3rd Ed.). Cambridge University Press.
5. Mukhopadhyay, A. K. (1998). *Mathematical Methods for Engineers and Physicists*. Wheeler.
6. Prakash, S. (2008). *Mathematical Physics*. S. Chand.

Websites and eLearning Sources

1. https://www.geogebra.org/
2. https://mathworld.wolfram.com/
3. https://swayam.gov.in/explorer?category=Mathematics
4. https://ocw.mit.edu/search/?d=Mathematics

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K- Level)**
CO1	acquire knowledge on different mathematical methods like vector calculus, multiple integrals and differential equations.	**K1**
CO2	understand the concepts and techniques of differential and integral vector calculus, multiple integrals and differential equations.	**K2**
CO3	apply vector calculus, differential equations and multiple integrals on various physical problems.	**K3**
CO4	solve various problems using differential equations, multiple integrals, and vector calculus to obtain the solutions.	**K4**
CO5	analyse and interpret the solutions obtained by mathematical methods.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**23UPH33CC03**		**Core Course - 3:** Mathematical Physics - 1							**5**	**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	3	3	3	2	2	**2.4**
CO2	3	3	2	2	1	3	2	3	2	2	**2.3**
CO3	3	2	2	2	1	2	3	2	2	2	**2.1**
CO4	3	2	2	2	1	2	2	3	2	2	**2.1**
CO5	3	3	2	2	2	3	2	2	2	2	**2.3**
										Mean Overall Score	**2.24 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UPH33CC04	**Core Course - 4:** Electromagnetism	5	5

Course Objectives
To recall the fundamental laws of electrostatic, magnetostatic, and electromagnetic fields.
To understand the various fields in electrostatics, magnetostatics, electromagnetics, and their relation.
To apply the principles of electrostatic and magnetostatics on solving problems involving electric, magnetic, and electromagnetic fields.
To examine the behaviour of electric, magnetic, and electromagnetic fields in matter.
To assess Maxwell's equations, Ampere's law, Biot-savart law, and Gauss law in differential and integral forms.

UNIT I: Electrostatics **(15 Hours)**

Electric field: Coulomb's law - charge distribution -Divergence and curl of E: Flux - Gauss's law- applications of Gauss's law in spherical - Cylindrical and Planar symmetry - Electric potential: potential of a localized charge distribution - Potential for a uniformly charged spherical shell and solid sphere - Work and Energy in Electrostatics: Energy of point charge distribution and continuous charge distribution - Conductors: Electric field and charge density inside and on the surface of a conductor - Surface charge and force on a conductor - Capacitor: capacitance of an isolated spherical conductor and parallel plate capacitor.

UNIT-II: Electric Field in Matter **(15Hours)**

Dielectrics: Induced dipoles - polarization -Field of a polarized object: bound charges - field inside the dielectric-Electric Displacement: Gauss's law in the presence of dielectrics - Linear dielectrics: Susceptibility - Permittivity and dielectric constant - Energy in dielectrics (parallel plate, spherical and cylindrical system filled with dielectric).

UNIT III: Magnetostatics **(15 Hours)**

Lorentz force: Magnetic Field-Force on a moving point charge - Biot-Savart's law: Steady current-magnetic field of a steady current- Applications of Biot-Savart's law: Determination of magnetic field on a straight wire - circular coil - Force between two straight current carrying wires Divergence and curl of magnetic field: Straight line current-The Divergence and Curl of B, Ampere's Law- applications of Ampere's law in: an infinite straight wire - an infinite planar surface and Solenoid -Comparison of magnetostatics and electrostatics- Magnetic vector potential: Vector potential.

UNIT IV: Magnetostatic Fields in Matter **(15 Hours)**

Magnetization: diamagnets - paramagnets and ferromagnets - torque and force on a magnetic dipole - effect of a magnetic field on atomic orbits- Field of a magnetized object: bound currents and its physical interpretation - magnetic field inside matter, auxiliary field H: Ampere's law in magnetized materials-linear and non-linear media: magnetic susceptibility and permeability.

UNIT V: Electrodynamics **(15 Hours)**

Electro motive force: Ohm's law - Lenz's law- Electromagnetic induction: Faraday's laws - induced electric field - self-inductance and mutual inductance - energy stored in magnetic field - Maxwell's equations: Electrodynamics before Maxwell - modified Ampere's law- Magnetic charge.

Teaching Methodology	Chalk and talk, Video lectures, Demonstrations with models, Seminars, Discussions and Handouts.

Book for Study

1. Griffiths, D.J. (2017). *Introduction to Electrodynamics*, (4th Ed.). Cambridge University Press.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	2	**2.1:** 2.1.1, 2.1.2, 2.1.3, 2.1.4 **2.2:** 2.2.1, 2.2.2, 2.2.3, 2.2.4 **2.3:** 2.3.1, 2.3.3, 2.3.4 **2.4:** 2.4.1, 2.4.2, 2.4.3

			2.5: 2.5.1, 2.5.2, 2.5.3, 2.5.4
II	1	4	**4.1:** 4.1.1, 4.1.2, 4.1.4 **4.2:** 4.2.1, 4.2.3 **4.3:** 4.3.1 **4.4:** 4.4.1, 4.4.3
III	1	5	**5.1:** 5.1.1, 5.1.2, 5.1.3 **5.2:** 5.2.1, 5.2.2 **5.3:** 5.3.1,5.3.2, 5.3.3,5.3.4 **5.4:** 5.4.1
IV	1	6	**6.1**: 6.1.1, 6.1.2, 6.1.3, 6.1.4 **6.2**: 6.2.1, 6.2.2, 6.2.3 **6.3**: 6.3.1 **6.4**: 6.4.1
V	1	7	**7.1:** 7.1.1, 7.1.2 **7.2:** 7.2.1, 7.2.2,7.2.3, 7.2.4 **7.3:** 7.3.1, 7.3.2, 7.3.3, 7.3.4

Books for Reference

1. Purcell, E. M., & Morin, D. J. (2013). *Electricity and Magnetism,* (3rd Ed.). Cambridge University Press.
2. Halliday, D., Resnick, R., & Walker, J. (2007). *Fundamentals of Physics,* (10th Ed.). Wiley Publications.

Websites and eLearning Sources

1. https://www.damtp.cam.ac.uk/user/tong/em.html
2. https://cosmolearning.org/video-lectures/maxwells-equations-12936/
3. https://www.youtube.com/playlist?list=PLD07B2225BB40E582
4. https://www.feynmanlectures.caltech.edu/II_04.html
5. https://oyc.yale.edu/physics/phys-201/lecture-1
6. http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/magnetostatics/index.htm

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

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire knowledge on the fundamentals of electrostatics, magnetostatics and electrodynamics.	**K1**
CO2	understand the behaviour of electric fields, electromagnetic fields, and electromagnetic waves.	**K2**
CO3	apply the principles of Coulomb's Law, Gauss's law, Biot-Savart's law, Ampere's law, and Faraday's laws in various systems.	**K3**
CO4	analyse electric field, electric potential, electric flux, magnetic field in different symmetry systems.	**K4**
CO5	assess Maxwell's equations, Ampere's law, Biot-savart law, and Gauss law in differential and integral forms.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**23UPH33CC04**			**Core Course - 4:** Electromagnetism						**5**	**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	3	3	3	2	2	**2.4**
CO2	3	2	2	2	2	2	3	2	3	2	**2.3**
CO3	3	2	2	3	2	3	3	2	1	2	**2.3**
CO4	3	2	2	2	2	3	3	2	1	2	**2.2**
CO5	3	2	2	2	2	3	2	3	1	2	**2.2**
										Mean Overall Score	**2.28 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UPH33AO01A	**Allied Optional -1:** Chemistry - 1	4	4

Course Objectives
To learn the nomenclature, hybridization, isomerism and the intermediates of organic compounds
To study the preparation, properties and mechanisms of alkanes and alkenes
To understand the structure and bonding of Boron, Sulphur and Phosphorous compounds
To explain the principles and applications of Analytical Techniques
To understand the principles of photochemistry

UNIT I: Hydrocarbons and Isomerism **(12 Hours)**

Nomenclature of simple hydrocarbons - covalent bond- bond length, bond angle, dipole moment, inductive effect, mesomericeffect and hyperconjugation effect. Hybridization - sp^3, sp^2, sp (examples: acetylene, ethylene and methane). Intermolecular forces-hydrogen bonding. Isomerism - geometrical and optical isomerism, asymmetry, (R, S notation not necessary). Reactive intermediates - carbocation, carbanion and carbon free radicals (generation, structure and stability).

UNIT II:Alkanes and Alkenes **(12 Hours)**

Methods of preparation of alkanes (Wurtz method, Kolbe's method, using Grignard reagent, using HI/P), chemical properties of alkanes - substitution reaction only (example: only halogenation of alkanes with free radical mechanism), conformation analysis of ethane, n- butane and cyclohexane. Methods of preparations of alkenes (Kolbe's method, Hoffman degradation, using Lindlar's catalyst, Birch reduction of alkynes, dehydration of alcohols, dehydrohalogenation of alkyl halides), chemical properties of alkenes - electrophilic addition mechanism (example: only mechanisms of bromination of alkenes, hydrohalogenation of alkenes, hydration of alkenes and addition of diborane to alkenes)

UNIT III:Bonding and Structure in Inorganic Compounds **(12 Hours)**

Bonding - ionic, covalent, metallic and non-covalent interactions - ionic bonding- lattice energy, Born Haber's cycle, factors influencing lattice energy - covalent bonding- Lewis theory and its limitations, VSEPR theory- deducing hybridization and predicting structure of some basic inorganic compounds (BF_3, NH_3, H_2O, PCl_5, Bent's Rule-PCl_3F_2, ClF_3, SF_4, I_3^-, SF_6, IF_7).

UNIT IV: Elements of Analytical Techniques **(12 Hours)**

Datain chemical analysis-Themean and the median,precision and accuracy, Types of Errors in chemical analysis- determinate errors and indeterminate errors. Chromatographic separations, classification of chromatographic methods, chromatogram, principles of TLC and HPLC and instrumentation of HPLC.

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

Difference between photochemical reactions and dark reactions, Laws of photochemistry Beer - Lambert's Law - derivation and applications, Einstein law of photochemical equivalence - quantum yield - kinetics of hydrogen-chlorine reaction, hydrogen-bromine reaction and decomposition of HI. Photophysical processes- Jablonski diagram, chemiluminescence.

Teaching Methodology	Chalk and Talk, PPT, Videos

Books for Study

1. Morrison, R. T., Boyd, R. N., & Bhattacharjee, K. (2010). *Organic Chemistry*, (7th Ed.). Pearson.
   Unit-I *Chapter 1*
   Unit-II *Chapter 3 and Chapter 8*
2. Lee, J.D. (2010). *Concise Inorganic Chemistry* (5th Ed.). Wiley-India.
   Unit-III *Chapter 4*
3. Skoog, D.A, West, D.M., Holler, F.J., and Crouch S R. (2014) . *Fundamentals of Analytical Chemistry* (9th Ed.). Brooks/Cole. Cengage Learning, Delmont. CA.
   Unit-IV *Chapter5, Chapter 31E and33*

Books for Reference

1. Atkins P W. (2009). *Physical Chemistry* (7th Ed.). Oxford University Press.
2. Finar, I. L. (1996). *Organic Chemistry*. Vol 1 & 2 (6th Ed.). Addison Wesley Longman Ltd.
3. Miessler, GL., Fischer, P.J., & Tarr, D.A. (2014). *Inorganic Chemistry (*5th Ed.). Pearson
4. Education. Inc.
5. Bruice, P Y. (2011). *Organic Chemistry* (8th Ed.). Pearson Ltd. University of California. Santa
6. Barbara.
7. Huheey, J.E., Keiter, E.A., Keiter, R.L., & Medhi, O.K. (2006). *Inorganic Chemistry: Principles of Structure and Reactivity* (4th Ed.). Pearson Education.

Websites and eLearning Sources

1. https://opentextbc.ca/chemistry/chapter/20-1-hydrocarbons/
2. https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch105-consumerchemistry/
3. http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch8/vsepr.html
4. https://www.edinst.com/blog/jablonski-diagram/
5. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbo ok_ Maps/Book%3A_Physical_Chemistry_(Fleming)/11%3A_Chemical_Kinetics_I

Hydrocarbons

Organic Chemistry

VSPER Theory

Jablonski-Diagram

Chemical Kinetics

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	explain the reactions of alkanes and alkenes and to apply them in new substrates.	**K1**
CO2	summarize principles of photochemistry and photophysics.	**K2**
CO3	understand the concepts of hybridization and isomerism in organic molecules.	**K3**
CO4	solve the problem son reaction rates using principles of chemical kinetics.	**K4**
CO5	examine the structures of various in organic compounds.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**23UPH33AO01A**			**Allied Optional - 1:** Chemistry - 1					**4**		**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	2	3	1	2	2	3	1	3	**2.2**
CO2	1	3	2	2	2	2	2	2	2	1	**1.9**
CO3	2	1	2	2	2	2	3	1	3	2	**2.0**
CO4	1	3	1	3	1	2	3	1	2	3	**2.0**
CO5	2	2	1	2	1	2	3	3	3	2	**2.1**
										Mean Overall Score	**2.04 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23UPH33AO01B	**Allied Optional - 1:** Computer Science - 1	4	4

Course Objectives

UNIT- I **(12 Hours)**

Introduction to the Internet: Computers in Business - Networking - Internet - Email - Resource Sharing - WWW - Protocols.

UNIT - II **(12 Hours)**

Introduction to HTML: Designing a home page - HTML document - Anchor tag - Hyperlinks - Head and Body sections - Header section - Title - Prologue - links - colourful pages - comments - body section - heading - Horizontal ruler - paragraph - tabs.

UNIT - III **(12 Hours)**

Images and pictures - Lists and their types - nested lists - table handling. Forms and form elements.

UNIT - IV **(12 Hours)**

Database System Applications - Database Systems versus File Systems - View of Data -Data Models - Database Languages - Database Users and Administrators - Transaction Management - Database System Structure - Application Architectures.

UNIT - V **(12 Hours)**

SQL Statements: Data Retrieval: SELECT, Data Definition Languages: Create, Alter, Drop, Rename, and Truncate, Data Manipulation Language: Insert - Update, Delete - Merge. Transactional Control: Commit, Rollback and Data Control Language: Grant, Revoke, Select Order By - Select Group By.

Teaching Methodology	Chalk and Talk, PPT

Book for Study

1. Xavier, C. (2000). *World Wide Web Design with HTM*, Tata McGraw Hill, New Delhi. Unit 1-3
2. Henry F. Korth Abraham Silberschatz. (2002). D*atabase System Concepts*, (4th Ed.). McGraw Hill, New Delhi.

Books for reference

1. Willard, W. (2009). W*eb Design - A beginners Guide.* Tata McGraw Hill Education, New Delhi.
2. Powell, T.A. *The Complete Reference Web Design*", Tata McGraw Hill, New Delhi.
3. Date, C.J. (2002). *An Introduction to Database System,* (7th Ed.). Pearson Education, New Delhi.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	define and understand the Internet concepts and Protocols.	**K1**
CO2	understand and classify the basic knowledge of HTML.	**K2**
CO3	apply the knowledge of HTML tags in web related applications.	**K3**
CO4	analyze the basic concepts of database &	**K4**
CO5	examine and analyze the skills of queries using SQL.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**23UPH33AO01B**			**Allied Optional - 1:** Computer Science - 1					**4**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	3	3	2	2	3	**2.4**
CO2	2	3	2	2	2	3	3	2	2	3	**2.4**
CO3	2	2	3	2	3	2	3	3	3	2	**2.5**
CO4	2	2	2	3	2	2	3	2	3	3	**2.4**
CO5	1	2	2	2	3	2	3	2	2	3	**2.2**
										Mean Overall Score	**2.38 (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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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 அறிவியல்கூறுகளைக் 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)**

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** ***இப்பாடத்தின் நிறைவில் மாணவர்கள்***	**Cognitive Levels (K - Level)**
CO1	பண்டைய தமிழர்களின்; அறிவியல் அறிவை அறிந்து கொள்வர்.	**K1**
CO2	பண்டைய தமிழ் இலக்கியங்களுள் காணாலும் அறிவியல் சிந்தனைகளைப் புரிந்துகொள்வர்.	**K2**
CO3	தமிழரின் அறிவியல் மருத்துவத்தையும், நீர் மேலாண்;மை 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 taches 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 passées, 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

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*. (2nd Ed.). CLE International.
2. Mérieux, R., & Loiseau, Y. (2012). *Latitudes A1*. 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** On successful completion of this course, students will be able to	**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

Books for Study

1. Bosalae, S. (2020). *kavya sarang*. Rajkamal Prakashan.
2. Gupth, 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.
3. Gosamy, K. (2016). *Anuvad vigyan ki Bhumika*. Rajkamal Prakashan.
4. Shukla, A. R (2021). *Hindi Sahitya Ka Itihas*, Prabhat Prakashan.

Websites and eLearning Sources

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

Course Outcomes		
CO No.	**CO-Statements** On successful completion of the course, the student will able to	**Cognitive Levels (K - Level)**
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-kalidasan plays in Sanskrit
To coach students in Sanskrit morphology
To acquaint students with the structures of Sanskrit syntax
To impart communicative skills in Sanskrit by training in the functional aspects of the language

UNIT I **(12 Hours)**

Samskrita Vyavahara sahasri vakiya Prayogaha

UNIT II **(12 Hours)**

Lot Lakaarah, Prayaogh Kartari Vaakyaani

UNIT III **(12 Hours)**

Naatakasya Itihaasah Vivaranam, Thuva and Tum Suffixs

UNIT IV **(12 Hours)**

Karnabhaaram , Naatakasya Visistyam

UNIT V **(12 Hours)**

Samskrita Racanani Vubhavoga

Teaching Methodology	Videos, PPt, Blackboard, Demonstration, Exercises

Books for Study

1. *Karnabhavam & Literature Language*
2. *Dhaatu Manjari*
3. Samskrita Vyavahara Sahasri (*A Collection of One Thousand Sentances*), Samskrita 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.learnsanskrit.org/guide/verbs-1/karmani-and-bhave-prayoga/
3. https://ia902903.us.archive.org/7/items/in.ernet.dli.2015.102820/2015.102820.The-Sanskrit-Drama-In-Its-Origin-Development-Theory-And-Practice.pdf
4. https://archive.org/details/oafI_karna-bharam-karnas-burden-of-bhasa-with-dr.-sudhakar-malaviya-gokuldas-sanskrit
5. https://sanskritwisdom.com/composition/essays/sanskrit-language/

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

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	23UPH43CC05	**Core Course - 5:** Mathematical Physics - 2	5	4

Course Objectives
To know the fundamental concepts and theorems in numerical methods, special functions, Fourier series, Laplace transforms and matrices.
To understand the principles of numerical methods, special functions, Fourier series, Laplace transforms and matrices.
To apply the basic principles of numerical methods, special functions, Fourier series, Laplace transforms and matrices on various physics problems.
To solve various physics problems using the numerical methods, special functions, Fourier series, Laplace transforms and matrices.
To analyze and investigate various physical systems using the mathematical theory.

UNIT I: Errors and Numerical Methods **(15 Hours)**

Significant figures - rounding off - types of error - error due to approximation of the function - Numerical methods: Transcendental Equation - Solving by Graphical Method - Newton Raphson method - Numerical Method of solving differential equation - Taylor series method Numerical Integration - Trapezoidal and Simpson's 1/3 rule.

UNIT II: Special Functions **(15 Hours)**

Definitions - simple properties of Gamma, Beta and Error functions - series solutions of differential equations - ordinary point: solutions and rules - Laguerre and Hermite: functions - polynomial - orthogonality.

UNIT III: Fourier Series **(15 Hours)**

Periodic functions - Fourier series - Dirichlet's conditions for a Fourier series - Advantages of Fourier series - Useful integrals - determination of Fourier coefficients (Euler's Formulae) - Fourier series for discontinuous functions - two or more sub-ranges - Even and Odd functions - half range series - half period series.

UNIT IV: Laplace Transforms **(15 Hours)**

Definition - formulae and proofs - properties - transform rules: Addition, scaling, derivatives, integrals, differentiation, integration of transforms, shift of the time function, shift of the transform function, periodic function - inverse Laplace transforms.

UNIT V: Matrices **(15 Hours)**

Types of matrices - inverse of a matrix - Elementary transformations - Solution of simultaneous equations - Eigen Values - Eigen vectors - properties of eigenvectors - orthogonal vectors - non-symmetric matrices with non-repeated eigen values - diagonalisation of a matrix - theorem on diagonalisation - complex matrices - transpose of conjugate of a matrix - Hermitian and skew - Hermitian matrices.

Teaching Methodology	Lectures, Presentations, Simulations, and Videos

Books for Study

1. Dass, H. K. (2014). *Higher Engineering Mathematics*, (3rd Revised Ed.). S. Chand.
2. Ramana, B. V. (2006). *Higher Engineering Mathematics*. Tata McGraw Hill.
3. Dass, H. K. (2014). *Mathematical Physics*, (7th Revised Ed.). S. Chand.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1,2	4, 50,32	4.1, 50.1-50.6, 50.10-50.15, 52.3,32.14
II	3	9, 27, 30, 31	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.18, 27.2, 27.3, 27.4, 27.5, 27.6, 30.2, 30.3, 30.4, 31.1, 31.3, 31.5
III	3	11	11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.10, 11.11, 11.13
IV	3	46, 47	46.1, 46.2, 46.3, 46.4, 46.5, 46.6, 46.7, 46.8, 46.10, 46.11, 46.12, 46.19, 46.21, 47.1, 47.2
V	3	38, 41	38.2, 38.13, 38.14, 41.1, 41.2, 41.5, 41.6, 41.7, 41.8, 41.19, 41.21, 41.24, 41.26, 41.27

Books for Reference

1. Kreyszig, E. (2010). *Advanced Engineering Mathematics*, (9th Ed.). Wiley.
2. Chapra, S. C., & Canale, R. P. (2015). *Numerical Methods for Engineers*, (7th Ed.). McGraw-Hill Education.
3. Weber, H., & Arfken, G. (2003). *Essential Mathematical Methods for Physicists*, (1st Ed.). Elsevier.
4. Riley, K., Hobson, M., & Bence, S. (2006). *Mathematical Methods for Physics and Engineering: A Comprehensive Guide*, (3rd Ed.). Cambridge University Press.
5. Prakash, S. (2008). *Mathematical Physics*. S. Chand.

Websites and eLearning Sources

1. https://www.geogebra.org/
2. https://mathworld.wolfram.com/
3. https://swayam.gov.in/explorer?category=Mathematics
4. https://ocw.mit.edu/search/?d=Mathematics

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire knowledge on different mathematical methods numerical methods, special functions, Fourier series, Laplace transforms and matrices.	**K1**
CO2	understand the concepts and techniques of numerical methods, special functions, Fourier series, Laplace transforms and matrices.	**K2**
CO3	apply numerical methods, special functions, Fourier series, Laplace transforms and matrices on various physical problems.	**K3**
CO4	solve various problems using numerical methods, special functions, Fourier series, Laplace transforms and matrices to obtain the solutions.	**K4**
CO5	analyse and interpret the solutions obtained by numerical methods, special functions, Fourier series, Laplace transforms and matrices.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**23UPH43CC05**			**Core Course - 5:** Mathematical Physics - 2						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	3	3	3	2	2	**2.4**
CO2	3	3	2	2	1	3	2	3	2	2	**2.3**
CO3	3	2	2	2	1	2	3	2	2	2	**2.1**
CO4	3	2	2	2	1	2	2	3	2	2	**2.1**
CO5	3	2	2	2	2	2	2	2	2	2	**2.1**
Mean Overall Score											**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UPH43CC06	**Core Course - 6:** Sound, Thermal and Statistical Physics	5	4

Course Objectives
To acquire the knowledge of sound waves and its applications, flow of heat, various thermodynamical processes and probability theorems.
To understand the physics of sound waves, the laws of thermodynamics, black body radiations and comparison of three statistics.
To apply the principles of sound waves, transmission of heat, thermodynamical laws and statistical thermodynamics in real cases.
To analyse the factors affecting sound waves, rectilinear flow of heat in different materials, thermodynamical laws and three statistics.
To categorize the different types of sound waves, application of thermodynamical laws and examine the three types of statistics and their applications.

UNIT I: Sound **(15 Hours)**

Wave motion - characteristics of wave motion - transverse, longitudinal wave motion - Newton's formula for velocity of sound - effect of temperature, pressure, density of the medium, humidity and wind - stationary waves - Helmholtz resonator, theory of resonator, vibrations in rods - Kundt's tube - Doppler effect - observer at rest and source in motion - source at rest and observer in motion - both source and observer are in motion - effect of wind velocity - Doppler effect in light.

UNIT II: Transmission of Heat **(15 Hours)**

Coefficient of thermal conductivity- rectilinear flow of heat along a bar - Forbes method - Lee's method for bad conductors and liquids - convection and its applications - Black body - Stefan Boltzmann law - Wien's displacement law - Rayleigh - Jeans law - derivation and experimental verification of Stefan's law - Newton's law of cooling from Stefen's law - solar constant - temperature of the Sun - Angstrom's Pyrheliometer.

UNIT III: Thermodynamics I **(15 Hours)** Thermodynamic system - zeroth law of thermodynamics - internal energy - I law of thermodynamics - reversible and irreversible process - Carnot's ideal heat engine - Carnot's cycle - internal combustion engine - Otto and diesel engine - second law of thermodynamics - entropy - change in entropy during reversible and irreversible process - entropy and second law of thermodynamics - third law of thermodynamics.

UNIT IV: Thermodynamics II **(15 Hours)**

Thermodynamic variable - Maxwell's thermodynamic relations - applications - Joule Thomson cooling - temperature of inversion - Clausius Clapeyron's latent heat equation - thermodynamic potential - TdS equation - Joule Thomson porous plug experiment - Joule Thomson expansion - liquefaction of gases - liquefaction of hydrogen and Helium - adiabatic demagnetization - refrigerator.

UNIT V: Statistical Thermodynamics **(15 Hours)**

Statistical equilibrium - probability theorems in statistical thermodynamics - Maxwell Boltzmann distribution law - Maxwell - Boltzmann distribution in terms of temperature - Phase space - Fermi-Dirac distribution law - application to electron gas - Bose-Einstein distribution law - application to photon gas - radiation laws - comparison of the three statistics.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Books for Study

1. Lal, L., & Subrahmanyam. N. (2005). *Sound*. Vikas Publishing House Pvt. Ltd.
2. Lal, B., Subrahmanyam, N., & Hemne, P. S (2018). *Heat, Thermodynamics and Statistical Physics*, (Revised Edition). S. Chand & Co.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	4 5 6 7 8	4.1, 4.3-4.5 5.4-5.9 6.1, 6.16, 6.17 7.12, 7.13 8.1-8.6
II	2	15 8	15.1, 15.2, 15.9, 15.10, 15.12, 15.22, 15.23 8.8, 8.12, 8.14, 8.15, 8.20, 8.22, 8.21, 8.26, 8.27, 8.28
III	2	4 5 6	4.1, 4.2, 4.6, 4.7, 4.20, 4.23, 4.24, 4.31, 4.33, 4.28 5.1-5.4, 5.6, 5.15 6.15
IV	2	6 2 7	6.1, 6.3, 6.4.2, 6.4.4, 6.4.7, 6.5, 6.9 2.21 7.5, 7.6, 7.10, 7.11, 7.16, 7.21
V	2	9 11 10 12	9.8 11.3, 11.4 10.4 12.8, 12.9, 12.5, 12.6, 12.7, 12.15

Books for Reference

1. Zemansky. M.W., & Dittman, R. (1981). *Heat and Thermodynamics*. McGraw-Hill.
2. Blundell, S. J., & Blundell, K. M. (2012). *Concepts in Thermal Physics*, (2nd Ed.). Oxford University Press.
3. Saha, M., & Srivastava, B. N. (1958). *A Treatise on Heat*. Indian Press.
4. Carl, S. H. (2009), *Modern Thermodynamics with Statistical Mechanics*. Springer.
5. Sears., & Salinger. (1988). *Thermodynamics, Kinetic Theory & Statistical Thermodynamics*. Narosa.
6. Garg, S., Bansal, R. & Ghosh. (1993). *Thermal Physics*, (2nd Ed.). Tata McGraw-Hill.
7. Mathur, D. S. (2014). *Heat and Thermodynamics*, (5th Ed.). Sultan Chand & Sons Educational Publishers.

Websites and eLearning Sources

1. https://scholar.harvard.edu/files/schwartz/files/lecture21-doppler.pdf
2. https://nptel.ac.in/courses/115104096
3. https://archive.nptel.ac.in/courses/112/104/112104113/
4. https://home.iitk.ac.in/~gtm/thermodynamics/ui/Course_home-34.htm
5. https://archive.nptel.ac.in/courses/104/103/104103112/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire the knowledge of sound waves and its properties, transmission of heat, reversible and irreversible process, entropy, temperature of inversion, liquefaction, statistical and quantum statistics.	**K1**
CO2	understand the concepts of wave motion, Doppler effect, black body radiations and its laws, Carnot's ideal heat engine, Otto and diesel engines, thermodynamic potentials, adiabatic demagnetization and the three statistical thermodynamics.	**K2**
CO3	compare the thermodynamic laws and its applications, types of wave motion and three statistics, apply the radiation laws for good and bad conductors.	**K3**
CO4	analyse the behaviour of sound waves, thermodynamics laws, types of transmission of heat and the three statistics.	**K4**
CO5	categorize the thermodynamic laws and their applications, examine the applications of Doppler effect and the three statistics.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
4	**23UPH43CC06**		**Core Course - 6:** Sound, Thermal and Statistical Physics							**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	2	3	2	3	2	3	2	1	**2.3**
CO2	3	3	2	2	3	3	2	2	2	1	**2.3**
CO3	3	2	2	3	3	2	3	3	2	1	**2.4**
CO4	3	2	2	3	3	2	2	3	2	1	**2.3**
CO5	3	3	2	2	3	2	2	3	2	1	**2.3**
Mean Overall Score											**2.32 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UPH43CP03	**Core Practical - 3:** Physics Practical - 3	**3**	**2**

Any 16 Experiments

1. Jolly's bulb - pressure coefficient
2. Thermal conductivity – Lee's disc.
3. Thermal Conductivity – Forbes' method.
4. y, n, ó – Searles method.
5. n and M.I – Torsional pendulum.
6. Compound pendulum.
7. Kater's pendulum
8. Kundt's tube.
9. Frequency – Melde's apparatus.
10. Young's modulus – uniform bending - scale and telescope method.
11. Young's modulus – Koenig's method.
12. Rigidity modulus - static method.
13. Rankine's method.
14. Spectrometer – i-d curve.
15. Spectrometer – i-i' curve.
16. Field along the axis of a coil – Vibration magnetometer.
17. Potentiometer – Ammeter calibration.
18. Resistance by Potentiometer – R and ρ.
19. B.G. – comparison of mutual inductance.
20. B.G. – Resistance and figure of merit (condenser method).
21. Absolute determination of M and H.
22. Junction diode and Zener diode characteristics.
23. Study of basic and universal logic gates (IC's).

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UPH43AO02A	**Allied Optional - 2:** Chemistry - 2	4	3

Course Objectives
To learn the chemistry of carbohydrates, amino acids, proteins
To study the theories of co-ordination compounds
To study the group 18 elements and silicates
To understand phase rule and adsorption
To understand the principles and applications of electrochemistry

UNIT I: Carbohydrates, Amino Acids and Proteins **(12 Hours)**

Synthesis of carbohydrates - photosynthesis-classification of carbohydrates (based on hydrolysis and reducing nature)- structure of (+)-Glucose, (-)- Fructose- epimers- mutarotation- conversion of glucose to fructose. Amino acids - classification (based on acidic and basic groups)-essential and non-essential amino acids-preparations (Gabriel synthesis, Strecker synthesis and Koop synthesis)-z witter ion formation- isoelectric point and its importance in the separation of amino acids- chemical properties (reactions involving both a mine group and carboxyl group) of glycine and alanine only. Proteins - peptide linkage - primary, secondary and tertiary structure of proteins.

UNIT II: Coordination Chemistry **(12 Hours)**

Coordination compounds- Werner's theory- central metal atom- types of ligands - nomenclature and isomerism of coordination compounds- effective atomic number- VBT - prediction of structure and calculation of spin only magnetic moment-crystal field theory of octahedral, tetrahedral and square planar complexes- effects of crystal field splitting- chelates- important biological complexes- haemoglobin, chlorophyll, cis-platin (representative structure and functions).

UNIT III: Silicates and Group 18 Elements **(12 Hours)**

Silicates-principles of silicate structures- classification-silicates in technology-silicones. Group18-Noblegas-physicalproperties-specialpropertiesofhelium-clathrates- structure and bonding in xenon compounds (XeF_2, XeF_4 and XeF_6).

UNIT IV: Phase Rule and Adsorption **(12 Hours)**

Phases- components- degree of freedom- derivation of Gibbs phase rule- phase diagram of H_2O, CO_2, S and Pb-Ag systems. Adsorption - Langmuir and Frend luichadsorption isotherms- applications of adsorption. Principles of TLC and column chromatography.

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

Difference between Galvanic cell and electrolytic cell- types of electrodes - metal - metalion electrode- Gas electrode (hydrogen electrode)- metal - insoluble metal salt electrodes (calomelelectrode)- oxidation-reduction electrode(quin hydrone electrode)-single electrode potential, oxidation potential and reduction potential- sign of electrode potential, Nernst equation, reference electrode, electro chemical series- electromotive force, potentiometric titrations - acid - base titrations- redox and precipitation titrations.

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

Books for study

1. Morrison, R.T., Boyd ,R.N., & Bhattacharjee, S.K. (2010). *Organic Chemistry,* (7th Ed.). Pearson.
   Unit I: *Chapter 34 and 36*
2. Lee, J. D. (2010). *Concise Inorganic Chemistry,* (5th Ed.). Wiley-India.
   Unit II: *Chapter7*
   Unit III: *Chapter 13 and 17*
3. Puri, B.R., Sharma, L.R., & Pathania, M.S. (1993). *Principles of Physical Chemistry,* (23rd Ed.). Shoban Lal Nagin Chand and Co.
   Unit IV: *Chapter 18 and 33*

Unit V: *Chapter 23*

Books for Reference

1. Atkins, P.W. (2009). *Physical Chemistry,* (7th Ed.). Oxford University Press.
1. Finar, I.L. (1996). *Organic Chemistry Vol 1 and 2,* (6th Ed.). Addison Wesley Longman Ltd.
2. Miessler, G.L., Fischer, P.J., & Tarr, D.A. (2014). *Inorganic Chemistry,* (5th Ed.). Pearson Education. Inc.
2. Bruice, P.Y. (2011). *Organic Chemistry,* (8th Ed.). Pearson Ltd. University of California.
3. Huheey, J .E., Keiter, E. A., Keiter, R.L ., & Medhi, O. K. (2006). *Inorganic Chemistry: Principles of Structure and Reactivity,* (4th Ed.). Pearson Education.

Websites and eLearning Sources

1. https://opentextbc.ca/chemistry/chapter/19-2-coordination-chemistry-of-transition-metals/
2. https://www.tulane.edu/~sanelson/eens211/silicate_structures08.htm
3. https://www.youtube.com/watch?v=HjeQOKomAQc
4. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry/Basics_of_Electrochemistry

Coordination

Chemistry Silicate

Structure Phase rule

Electrochemistry

Course Outcomes		
CONo.	**CO-Statements** On successfully completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	list out the different types of carbohydrates, aminoacids and proteins.	**K1**
CO2	explain the concepts in coordination chemistry and apply them to infer the properties of complexes.	**K2**
CO3	outline the principles and applications of electrochemistry.	**K3**
CO4	illustrate phase rule and relate the applications of adsorption.	**K4**
CO5	classify silicates and understand the irindustrial applications.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
4	**23UPH43AO02A**		**Allied Optional - 2:** Chemistry - 2						**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	2	3	1	3	2	**2.2**
CO2	2	3	2	3	2	2	2	3	2	3	**2.4**
CO3	2	3	2	2	2	2	2	3	3	1	**2.2**
CO4	2	3	1	3	3	2	3	1	3	3	**2.4**
CO5	2	3	1	2	1	2	3	3	3	2	**2.2**
Mean Overall Score											**2.28 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UPH43AO02B	**Allied Optional - 2:** Computer Science - 2	4	3

Course Objectives

UNIT I **(12 Hours)**

Introduction to Computer Networks and Data Communication: Need for Computer Networks-Evolution-Data Communication Fundamentals-Data Transmission- Transmission Media.

UNIT II **(12 Hours)**

Network Classification, Communication and Components: Classification of Computer Networks-Switching and Routing-Routing-Multiplexing and Concentration-Concentrator-Terminal Handling-Components of Computer Network.

UNIT III **(12 Hours)**

Network Standards and OSI Model: Need for Network Standards-The OSI Reference Model. Local Area Network: The Evolution of LAN-LAN Architecture-LAN advantages and Services-Characteristics of LAN-LAN Topologies.

UNIT IV **(12 Hours)**

Wireless LAN and VSAT: Wireless LANs-Components of Wireless LAN-Working of Wireless LANs - Infrared Technology-Wireless LAN Types-Protocols for Wireless LAN-Uses of Wireless LANs-Bluetooth Technology.

UNIT V **(12 Hours)**

Introduction to Internet of Things: Definition of Internet of Things -Application Areas of IoT-Characteristics of IoT-Things in IoT-IoT Stack-Enabling Technologies-IoT Challenges.

Teaching Methodology	Chalk and Talk, PPT

Book for Study

1. Rajesh, E., & Balasubramanian. (2002). *Computer Networks, Fundamentals and Applications*, Vikas Publishing House Pvt. Ltd.
   Unit I: Chapter-1
   Unit II:Chapter-2
   Unit III: Chapter-3 (Sec.3.1 & 3.2) Chapter-5 (Sec.5.1 to 5.5)
   Unit IV: Chapter-7 (Sec.7.1 to 7.3, 7.5 to 7.7, 7.9 & 7.12)
2. Vasudevan, S.K., Nagarajan, A.S., & Sundaran, R.M.D. (2020). *Internet of Things*, (2nd Ed.). Wiley Publication.
   Unit V: Chapter-1 (Sec.1.1, 1.3 to 1.8)

Books for reference

1. Stallings, W. (2004). *Data and Computer Communications*, (7th Ed.). Prentice Hall of India.
2. Tanenbaum, A.S. (1999). *Computer Networks*. Prentice Hall of India, New Delhi.
3. Bahga, A., & Madisetti, V. (2015). *Internet of Things- A Hands-on Approach*. Universities Press Private Limited, India.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	understand the foundations of data communications	**K1**
CO2	appraise the classification and basic concepts of Switching and Routing	**K2**
CO3	analyze the concepts of LAN Network	**K3**
CO4	use the concepts of Wireless LAN Technology	**K4**
CO5	acquire the basic knowledge on IoT	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**23UPH43AO02B**			**Allied Optional - 2:** Computer Science - 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	2	2	3	3	2	2	3	**2.4**
CO2	2	3	2	1	2	3	3	2	2	3	**2.3**
CO3	1	2	3	2	3	2	3	2	3	3	**2.4**
CO4	2	2	2	3	2	2	3	2	2	3	**2.3**
CO5	2	2	2	2	3	1	3	2	2	3	**2.2**
										Mean Overall Score	**2.32 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23UPH43OP01A	**Allied Optional Practical:** Chemistry Practical	2	1

Course Objectives
To learn the safety in the lab
To understand the principles of titrimetric analysis
To understand the principles of organic qualitative analysis

UNIT I: Safety Rules in the Laboratory **(6 Hours)**

Introduction-personal protection-nature of chemicals- toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals- philosophy of lab safety - first-aidtechniques-generalworkcultureinsidethechemistrylab-handlingofchemicalsand apparatus in the laboratory: storage and handling of chemicals - disposal of chemical wastes- glassware - handling of glassware - handling of different types of laboratory equipment's like bunsen burner-centrifuge- Kipp's apparatus.

UNIT II: Volumetric Analysis **(6 Hours)**

Volumetric analysis - principle - standard solutions - normality and molarity - principles of titrations-primary standard and secondary standard solutions- acid-base titration- redox titration-complexometrictitration-precipitationtitrationandexampleofeachwithindicators used.

UNIT III: Theory of Organic Qualitative Analysis **(6 Hours)**

Qualitative analysis of organic substances: solubility test in $NaHCO_3$- NaOH and HCl-test for saturation and unsaturation-aliphatic and aromatic- acidic- basic andneutral nature- element test for N, S and halogens.

UNIT IV:3 Volumetric Analysis **(6 Hours)**

1. Estimation of HCl (Std. oxalic acid xNaOHxHCl).
2. Estimation of NaOH (Std.Na2CO3xHClxNaOH).
3. Estimation of oxalic acid (Std.FASxKMnO4x oxalic acid).
4. Estimation of FAS (Std. oxalicacidxKMnO4x FAS).
5. Estimation of KMnO4 (Std. K2Cr2O7xFASxKMnO4).
6. Estimation of K2Cr2O7by Thiosolution.
7. Estimation of Na2CO3byHCl using a standard Na2CO3solution.
8. Estimation of zinc (EDTA titration).
9. Estimation of magnesium (EDTA titration).
10. Estimation of hardness of water (EDTA titration).

UNIT V: Organic Analysis **(6 Hours)**

1. Identification of acidic, basic, phenolic and neutral organic substances.
2. Test for aliphatic and aromatic nature.
3. Test for saturation and unsaturation.
4. Preparation of sodium fusion extract.
5. Detection of N, S, and Cl.

Books for Study

1. Puri, B.R., Sharma, L.R., & Kalia, K. K. (1993). *Principles of Inorganic Chemistry,* (23rd Ed.). Shoban Lal. Nagin Chand and Co.
   Unit II *Chapter 41.*
2. Gnanapragasam, N.S., & Ramamurthy, G. (2007). *Organic Chemistry Lab Manual,* (2nd Ed.). S. Viswanathan Printers and Publishers (P) Ltd.
   Unit III *Part A*
3. (2021). *Allied Practical Manual*. Department of Chemistry. St. Joseph's College. (Private circulation).Books for Reference
4. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A.R. (1997). *Basic Principles of*

Practical Chemistry, (2nd Ed.). Sultan Chand and Sons.
5. Furniss, B.S. (1984). *Vogel's Textbook of Practical Organic Chemistry,* (7th Ed.). ELBS Longman.

Websites and eLearning Sources

1. https://www.youtube.com/watch?v=FUo428guKt0
2. https://www.youtube.com/watch?v=_G6_OEa1BjA

Detection of Elements

Acid-Base Titration

Note:

1. Mono-functional compounds are given for organic analysis.
2. Each student is expected to practice the analys is of atleast10 different organic substances.
3. Apart from the TWOCIA tests, one MODELTEST comprising both volume tric and organic analysis is to be conducted to enable the students ready for semester examination.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	know about the handling of chemicals and safety measures in the laboratory.	**K1**
CO2	estimate the principle of volumetric analysis and various types of titration.	**K2**
CO3	illustrate the theoretical aspects of organic analysis.	**K3**
CO4	detect various lements present in the organic compounds.	**K4**
CO5	demonstrate various techniques of volume tricanalysis.	**K5**

Relationship Matrix											
Semester	**Course code**			**Title of the Course**					**Hours**		**Credits**
4	**23UPH43OP01A**			**Allied optional:** Chemistry Practical					**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	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
4	23UPH43OP01B	**Allied Optional Practical:** Computer Science Practical	2	1

Course Objectives

1. Simple web page with all the Text Formatting tags
2. Adding Images to Web Pages
3. Creating Lists (Ordered and Unordered List)
4. Adding Links to Web Pages
5. Creating Tables using various attributes
6. Creating Frames
7. Designing forms (DDL)
8. Implementation of Data Definition language commands
9. Implementation of DML, TCL and DCL commands

Simple Projects using HTML

1. Web blogs creation.
2. Department Website creation.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	understand the various text formatting tags, adding images to web page, presenting list of information.	**K1**
CO2	apply the knowledge in creating a simple web page with links to other web page and display information in table form.	**K2**
CO3	design a form in a web page and divide the browser window in multiple sections using frames.	**K3**
CO4	categorize various commands in SQL.	**K4**
CO5	analyze and build a web page.	**K5**

Relationship Matrix											
Semester	**Course code**			**Title of the Course**					**Hours**		**Credits**
4	**23UPH43OP01B**			**Allied Optional Practical:** Computer Science Practical					**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	2	2	1	2	3	3	2	2	2.3
CO2	2	3	2	2	1	2	3	3	2	2	2.2
CO3	3	2	2	2	2	2	3	3	2	2	2.3
CO4	3	3	2	3	2	2	2	3	2	1	2.3
CO5	3	3	2	3	2	2	3	3	2	2	2.5
										Mean Overall Score	**2.32 (High)**

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 Working with Passion.* Australia, Woodslane Pty Limited.

Websites and eLearning Sources

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

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

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
4	**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

Book for Study

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

Book 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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	23UPH53CC07	**Core Course - 7:** Optics	4	4

Course Objectives
To recall the properties of light and apply them in lenses and prism.
To understand the central concepts and basic formalisms of interference, diffraction, polarization and basics of Fiber optics.
To apply the concepts in interference, diffraction and polarization to solve relevant numerical problems related to relevant optical applications.
To analyse some of the fundamental laws and principles of light which are used in many important optical instruments.
To evaluate the interaction of light with matter and a few applications.

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

Dispersion of Light - Dispersive Power - Achromatism in prism - Deviation without dispersion - Dispersion without deviation - Aberration - Spherical aberration - methods of minimizing spherical aberration - Chromatic aberration of a lens - Longitudinal chromatic aberration - Lateral chromatic aberration - Achromatic combination of lenses - Conditions for achromatism of two lenses placed in contact - Two lenses separated by a finite distance.

UNIT II: Interference **(12 Hours)**

Interference - Young's double slit experiment - Condition for sustained interference of light - Fresnel's biprism - Determination of wavelength of light - Interference in thin films due to reflected and transmitted light - Fringes in wedge shaped films - colors in thin films - Newton rings - circular fringes - Reflected and anti-reflected coating thin films due to transmission - Michelson's Interferometer and its applications.

UNIT III: Diffraction **(12 Hours)**

Fresnel's diffraction - Fresnel's explanation of rectilinear propagation of light - Zone plate - construction - Diffraction at circular aperture and straight edge - Fraunhofer diffraction - Diffraction at single and double slit - Plane transmission grating - theory - Determination of wavelength of light using grating (Normal Incidence) - Resolving power - Rayleigh's criterion for resolution power of a telescope and grating.

UNIT IV: Polarization **(12 Hours)**

Plane of polarization - Polarization of reflection - Brewster's law - pile of plates - Polarization by reflection - Malu's law - double refraction - Nicol prism - Theory of Production of elliptically and circularly polarized light - Quarter wave plate - Half-wave Plate - Detection of plane, circularly and elliptically polarized light - Optical activity.

UNIT V: Optical Fiber **(12 Hours)**

Optical Fiber - Optical Fiber system - Total internal reflection - Propagation of light through an optical fiber - critical angle - acceptance angle - the numerical aperture - multimode fibers - plastic optical fibers - attenuation in optical fibers - material dispersion - fiber optic sensors - Merits of optical fibers.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Books for Study

1. Subrahmanyam, N., Lal, B., & Avadhanulu, M. N. (2015). *A text book of Optics*, (25th Ed.). S. Chand Publishing.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	8, 9 & 10	8.1, 8.2, 8.3, 8.4, 8.6, 8.7, 8.8, 9.1, 9.2, 9.5, 9.6, 9.10, 9.11, 9.13
II	1	14 & 15	14.4, 14.5, 14.7, 14.9, 14.9.2, 15.1, 15.2.1, 15.3, 15.5, 15.5.4, 15.6, 15.6.2, 15.15, 15.7
III	1	17, 18 & 19	17.3, 17.4, 17.5, 17.8, 17.10, 18.2.2,18.4, 18.7, 18.7.1, 19.1, 19.7, 19.12
IV	1	20	20.2, 20.6, 20.6.1.1, 20.6.2, 20.9, 20.11, 20.12, 20.19.1, 20.19.2, 20.20, 20.27
V	1	24	24.2, 24.2.2, 24.3, 24.4, 24.4.1, 24.4.2, 24.6, 24.8, 24.12, 24.12.2, 24.15.1, 24.16.2, 24.23, 24.22

Books for Reference

1. Rajpal, S., Sirohi. (2012). *Wave Optics and its Application*, (1st Ed.). Orient Blackswan Publication.
2. Jenkins, F. A., & White, H. E. (1957). *Fundamentals of Optics*, (3rd Ed.), McGraw-Hill.
3. Kakani, S. L., & Bhandari, K. C. S. (2005). *A text book of Optics*, (10th Ed.). Chand and Sons.
4. Khanna., & Gulati. (1991). *Fundamentals of Optics*, (14th Ed.). R. Chand & Co.

Websites and eLearning Sources*

1. https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics spring-2009/
2. https://nptel.ac.in/courses/115/107/115107095/
3. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ph09/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	recite the concepts of Geometrical optics and Waveoptics.	**K1**
CO2	understand various natural phenomena (like interference and diffraction) that are happening in their surroundings.	**K2**
CO3	apply the knowledge of interference, diffraction, polarization and Optical fibers and study the basic principles behind fiber optic sensors.	**K3**
CO4	analyze the interference, diffraction, polarization and evaluate the functions of an optical instrument.	**K4**
CO5	design and align optical elements to set up new optical systems.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
5	**23UPH53CC07**			**Core Course - 7:** Optics					**4**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	1	3	2	3	3	1	**2.2**
CO2	3	3	3	2	1	3	2	2	3	1	**2.3**
CO3	3	2	2	3	1	3	3	3	2	1	**2.3**
CO4	3	3	2	3	1	3	3	2	2	1	**2.3**
CO5	3	2	2	3	1	3	2	3	3	1	**2.3**
Mean Overall Score											**2.38 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53CC08	**Core Course - 8:** Concepts of Modern Physics	4	4

Course Objectives
To recall the Special theory of relativity and the basic concept of the Big Bang theory.
To understand the effect of Doppler Effect and the Wave Properties of Particles.
To acquire the basic knowledge of Particle Properties of Waves and the knowledge of Cosmology and Nano science.
To identify the experimental verifications of relativity, cosmology and nanoscience.
To analyse the atomic clock measurements and nano measurements.

UNIT I: Special Theory of Relativity-I **(12 Hours)**

Frames of reference - The Need for Ether - The Michelson-Morley Experiment - Einstein's Postulates - The Lorentz Transformation - Time Dilation and Length Contraction - Addition of Velocities - Experimental Verification - Muon Decay - Atomic Clock Measurement - Testing Lorentz Symmetry - Twin Paradox - Space-time.

UNIT II: Special Theory of Relativity-II **(12 Hours)**

Doppler Effect - Applications of the Doppler Effect - Relativistic Momentum - Relativistic Energy - Total Energy and Rest Energy - Equivalence of Mass and Energy - Relationship of Energy and Momentum - Massless Particles - Computations in Modern Physics - Binding Energy - Electromagnetism and Relativity.

UNIT III: Particle Properties of Waves **(12 Hours)**

Electromagnetic Waves - Blackbody Radiation, Ultraviolet catastrophe, Planck’s radiation formula - Photoelectric Effect, quantum theory of light - Thermionic emission - Dual nature of light - X-Rays - X-Ray Diffraction - Compton Effect: Theory and experiment - Pair Production - Photon absorption - Photons and Gravity - Gravitational red shift.

UNIT IV: Wave Properties of Particles **(12 Hours)**

De Broglie Waves - Probability Waves - Describing a Wave - Phase and Group Velocities - Particle Diffraction - Davisson and Germer experiment - Particle in a Box - Uncertainty Principle I (wave) - Gaussian function - Uncertainty Principle II (particle) - Application of the Uncertainty Principle, Energy and time - Interferometry with electrons and atoms - Quantum interference with electron beam.

UNIT V: The Big and The Small: Cosmology and Nanoscience **(12 Hours)**

Evidence of the Big Bang - Hubble’s Measurements - Cosmic Microwave Background Radiation Nucleo synthesis - Olbers’ Paradox - The Big Bang - Stellar Evolution - The Ultimate Fate of Stars - Planck’s Time, Length, and Mass - Active Galactic Nuclei and Quasars - Novae and Supernovae - Problems with the Big Bang - The Inflationary Universe - The Lingering Problems - Nanoscale: Carbon Nanotubes - Graphene - Nano Electronics - Quantum wires -Quantum dots.

Books for Study

1. Stephen, T. T., & Rex, A. (2013). *Modern Physics for Scientists and Engineers*, (4th Ed.). Brooks/Cole, Cengage Learning,
2. Besier, A., Mahajan, S., & Choudhury, R. S. (2017). *Concepts of Modern Physics*, (7th Ed.). McGraw Hill Education.
3. Binns, C. (2010). *Introduction to Nanoscience and Nanotechnology*. John Wiley & Sons.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	2	2, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9
II	1	2	2.10, 2.11, 2.12, 2.13, 2.14
III	2	2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9
IV	2	3	3.1, 3.2, 3.3, 3.4, 3.5, 3.5, 3.6, 3.7, 3.8, 3.9
	1	16	16.1, 16.2, 16.3, 16.4, 16.5

V	3	1 3	1.1 3.1, 3.8, 3.9, 3.10
		5	5.1, 5.2, 5.3, 5.4

Books for Reference

1. Serway. R. A., Moses & C. J. Moyer. C.A. (2004). *Modern Physics*, (3rd Ed.). Brooks/Cole Publications.
2. Tipler, P. A. & Lewellyn, R. L. (2007). *Modern Physics*, (5th Ed.). W.H. Freeman.
3. Resnick, R. (2007). *Introduction to Special Relativity*, (1st Ed.). Wiley Publications.
4. Sattler, K. D. (2011). *Hand book of Nanophysics*. CRC Press.

Websites and eLearning Sources

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. https://www.understandingnano.com/
4. https://ras.ac.uk/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire conceptual knowledge of space-time, frames of references and creating changes of physical parameters, their behaviour as ap articulate and matter waves and to differentiate the size of the matter.	**K1**
CO2	explain and demonstrate various theoretical and experimental methods in relativity, quantum physics and cosmology.	**K2**
CO3	apply suitable methods to solve problems in physics of subatomic structure, matter waves and relativistic speeds.	**K3**
CO4	examine the existence of solution to a problem.	**K4**
CO5	compare the concepts of modern physics to a real-life problem under different situations.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
5	**23UPH53CC08**			**Core Course - 8:** Concepts of Modern Physics					**4**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	2	3	2	2	2	2	**2.3**
CO2	3	3	3	2	2	3	2	2	2	1	**2.3**
CO3	3	3	2	3	2	3	3	2	2	1	**2.4**
CO4	3	3	3	3	2	3	3	2	2	1	**2.5**
CO5	3	3	2	3	2	2	3	2	2	3	**2.5**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53CP04	**Core Practical - 4:** Physics Practical - 4	6	2

Any 16 Experiments

1. Spectrometer – grating – normal incidence.
2. Spectrometer – grating – minimum deviation.
3. Magnetic moment – using coil carrying current by Cu voltmeter.
4. Magnetic moment – using coil carrying current by ammeter.
5. Determination of Stefan's constant.
6. Earth inductor – magnetic field of the Earth.
7. Fresnel's biprism – wavelength, refractive index and thickness of transparent sheet.
8. B.G. - absolute Mutual Inductance.
9. B.G. – absolute Capacitance
10. Zener Diode - regulated power supply.
11. Clipping and clamping circuits – construction and performance study
12. Conversion of galvanometer into an ammeter.
13. Conversion of galvanometer into voltameter.
14. Transistor characteristics – CB mode.
15. Transistor characteristics – CE mode.
16. FET – characteristics.
17. Hartley oscillator using BJT – f and Inductance
18. Colpitt's oscillator using BJT – f and Inductance
19. Study the frequency response of transistor CE amplifier.
20. Study the frequency response of FET amplifier.
21. Logic gates using Diodes and Transistors – construction and operation.
22. De-Morgan's theorem and Boolean algebra – verification using logic gates
23. Specific Rotation of Sugar solution by Polarimeter.
24. Two port network analysis – admittance, transmission and h parameters.
25. PWM using IC555 – construction and performance study
26. Thevenin's and Norton theorems – verification and measurement
27. Study of transistor biasing
28. Solar Characteristics measurement
29. Study of Diamagnetism, Paramagnetism and Ferromagtism.
30. Verification of Biot-Savart's law
31. Faraday effect – rotation of the plane polarized light beam, Verdet constant and e/m
32. BH loop – Retentivity, Permeability, Residual Magnetism and Reluctance
33. Determination of Transistor h-parameter
34. Anderson's Bridge – self-inductance and inductive reactance.
35. Determination of Planck's constant using LED and Photo diode

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53ES01A	**Discipline Specific Elective - 1:** Analog and Digital Electronics	5	3

Course Objectives
To Study of the characteristics and operations of semiconductor devices and analog, digital circuits.
To explain the concepts and analysis procedure of analog and digital circuits.
To apply the operations semiconductor devices in analog and digital circuits.
To assess the need of analog and digital circuits for different applications.
To evaluate the working of analog and digital circuits of simple applications.

UNIT I: Diode Applications, BJT and FET Amplifier **(15 Hours)**

Review of diodes and transistors - LED - Tunnel Diode - Switching circuits: clipping and Clamping; Power supply: Linear Power Supply - SMPS. Amplifier: h-parameter - Frequency response of common emitter amplifier - MOSFET switch and amplifier - class-D amplifier.

UNIT II: Oscillators **(15 Hours)**

Positive Feedback - Barkhausen Criterion - classification of oscillators - Phase shift oscillator -Wien Bridge oscillator - Tuned oscillator - Hartley oscillator - Crystal oscillator - Clock generator; Modulation: PWM - PAM - PCM - ASK - FSK.

UNIT III: Operational Amplifiers **(15 Hours)**

Op-amp - Ideal Op-amp - Parameters of Op-amp - Practical Op-amp - Voltage transfer curve -Open loop configuration - Closed loop configuration - Comparator - Summing amplifier - Logarithmic amplifier - Error amplifier - Schmitt Trigger - fixed frequency, pulse width modulation control circuit (IC TL494).

UNIT IV: Combinational Logic Circuits **(15 Hours)**

Basic and Universal gates - K-map simplification - 4:1 and 16:1 Multiplexer - 1:4 and 1:16 Demultiplexer - Encoder - Decoder - Priority Encoder - Parity generator and checker; Electrical characteristics: TTL, CMOS, NMOS.

UNIT V: Sequential Logic Circuits **(15 Hours)**

Flip-Flops (RS, JK, D, T) - Shift Register - 4-bit Asynchronous Counter - 4-bit Synchronous Counter - Decade Counter - Pre-settable counter - Mod counter - EEPROM - Static and Dynamic RAM - Solid State Disc.

Teaching Methodology	Black board teaching, PPT, Video lectures, Demonstrations with models, Handouts.

Books for Study

1. Bakshi, U. A., & Godse, A. P. (2009). *Analog and Digital Electronics*. Technical Publications Pune.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	1, 2	1.2, 1.7, 2.3-2.6
II	1	4	4.2, 4.3, 4.4, 4.5.2, 4.6, 4.8, 4.9, 4.12, 4.13
III	1	9	9.1, 9.2, 9.3, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.14, 9.15
IV	1	5	5.2, 5.3, 5.4, 5.5, 5.6
V	1	6, 7, 8	6.4, 6.5, 6.6, 7.2, 7.3, 8.2, 8.5, 8.7, 8.8

Books for Reference

2 Luecke, J. (2005). *Analog and Digital Circuits for Electronic Control System Applications*. Elsevier.

3. Anil Kumar Maini. (2007). *Digital Electronics*. John Wiley & Sons Ltd.

Websites and eLearning Sources

1. https://en.wikipedia.org/wiki/Digital_electronics
2. https://en.wikipedia.org/wiki/Analogue_electronics

3 https://www.elprocus.com/difference-between-analog-circuit-and-digital-circuit/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	describe semiconductor devices and outline the concepts of analog and digital circuits.	**K1**
CO2	understand the concepts and analyse the analog and digital circuits forvarious applications.	**K2**
CO3	examine real time problems, implement with analog and digital circuits by employing modern tools.	**K3**
CO4	assess the need of modern society with professional ethics inelectronics and recommend solutions for the same.	**K4**
CO5	evaluate the electronic project to plan an eco-friendly environment.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
5	**23UPH53ES01A**	**Discipline Specific Elective - 1:** Analog and Digital Electronics								**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	3	2	3	3	2	3	2	**2.6**
CO2	3	3	3	2	2	3	3	3	3	2	**2.7**
CO3	3	3	3	2	2	3	3	3	3	2	**2.7**
CO4	3	3	3	2	2	3	3	2	3	2	**2.6**
CO5	3	3	2	2	2	3	3	3	2	2	**2.5**
										Mean Overall Score	**2.62 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53ES01B	**Discipline Specific Elective - 1:** Design of Analog and Digital Circuits	5	3

Course Objectives
To describe various analog and digital circuits.
To understand the principle and working of analog and digital circuits of various applications.
To apply the working principle of semiconductor devices in different circuits.
To analyse the working of networks, oscillators, op amp circuits, combinational and sequential logic circuits.
To evaluate the performance of different analog and digital circuits.

UNIT I: Network Analysis **(15 Hours)**

Networks and Kirchhoff's law - Series resistors - Parallel resistors - Voltage - Thevenin's - VoltageDivider - Connected Circuits and Power Transfer - Matrix Solution of Resistor Networks - MatrixForm of the Resistance Network and Example - Solution for the Effective Resistance - Circuit Practice - Reflection - Symmetric Network - Series and Parallel Light Bulbs - Thevenin Circuit.

UNIT II: Design of Amplifiers and Oscillators **(15 Hours)**

Common - Emitter Amplifier - Bias Network (AC Coupling) - Transistor Differential Amplifier - Ebers - Moll Equation - JFET voltage amplifier - MOSFET - Transistor phase shift oscillator -JFET Wein's bridge oscillator - Transistor astable multivibrator.

UNIT III: Op Amp: Design of ADC, DAC and Analog Computer **(15 Hours)**

Op-amp basics - Op-amp circuits - Op-amp (closed and open loop) - Filters - Instrumentation amplifier - Finite gain analysis - Bandwidth - Comparator - PID Control - R-2R ladder DAC - Successive Approximation Register ADC - analog computation.

UNIT IV: Design of Combinational Logic Circuits **(15 Hours)**

K-map Simplification - Design of 4:1 and 16:1 Multiplexer - Design of 1:4 and 1:16 Demultiplexer - Encoder - Decoder - 1-bit full Adder - 1-bit full subtractor - Design of Multiplexer case study: thermocouple monitor.

UNIT V: Design of Sequential Logic Circuits **(15 Hours)**

Flip-flops - 4-bit Asynchronous Counter - 4-bit Synchronous Counter - Shift register - State machine programmable logic device - SRAM - DRAM - Design of pulse-area stabilizer - Design of counter divide by 2 and 3.

Teaching Methodology	Black board teaching, PPT, Video lectures, Demonstrations with models, Handouts.

Book for Study

1. Steck, A. D. (2015). *Analog and Digital Electronics*. Department of Physics, University of Oregon.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	1	All
II	1	4, 5	4.8, 4.9, 4.10, 4.11, 5.2, 5.4.3, 5.6
III	1	7, 8, 16	7.1, 7.3, 7.4, 7.5, 7.7, 7.8, 7.9, 8.1, 8.4, 16.1, 16.2
IV	1	10, 12	10.3, 10.4.2, 12.1-12.7
V	1	13	13.1-13.9

Books for Reference

1. Agarwal, A., & Jeffrey, H. L. (2005). *Foundations of Analog and Digital Electronic Circuits*. Elsevier.
2. Johan, H. H., Steyaert, M., & Roermund, A.V. (2003). *Analog Circuit Design*. Kluwer

Academic Publishers.
3. Balch. M. (2003). *Complete Digital design*. McGraw-Hill.
4. John, E. A. (2005). *Digital Integrated Circuits*. CRC Press.

Websites and eLearning Sources*

1. https://www.synopsys.com/glossary/what-is-analog-design.html
2. https://neurophysics.ucsd.edu/courses/physics_120/Agarwal%20and%20Lang%20(2005)%20Foundations%20of%20Analog%20and%20Digital.pdf
3. https://medium.com/@TeksunGroup/difference-between-analog-design-and-digital-design-18c5d1ce566a

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	acquire the knowledge of basic network concepts emphasizing series and parallel combination of passive components, discuss working principle and biasing concepts of JFETs and MOS FETs, and outline the concepts of op amp and its basic circuit operation.	**K1**
CO2	experimenting the configuration of Op-amp into its application tosolve various circuit parameters.	**K2**
CO3	apply the working principle of various analog and digital instruments and analyse them in the measurement of physical parameters	**K3**
CO4	assess the need of automatic electronics devices by the society and recommend solutions by inventing the circuits.	**K4**
CO5	evaluate the requirements of analog and digital circuits for social needs.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
5	**23UPH53ES01B**	**Discipline Specific Elective - 1:** Design of Analog and Digital Circuits								**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	2	2	3	3	3	3	2	**2.7**
CO2	3	3	3	2	2	3	3	2	3	2	**2.6**
CO3	3	3	2	3	2	3	3	2	3	2	**2.6**
CO4	3	3	3	2	2	3	3	2	3	2	**2.6**
CO5	3	3	2	3	2	3	3	2	3	2	**2.6**
										Mean Overall Score	**2.62 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53ES02A	**Discipline Specific Elective - 2:** Classical Mechanics	5	3

Course Objectives
To recognize the various laws and principles involved in Newtonian Mechanics.
To interpret and find the solution for central force problem in a dynamic system.
To articulate the understanding of dynamic system using Lagrangian, Hamiltonian and Euler formalisms.
To solve the problems of classical Mechanics by applying Euler, Lagrangian, Hamiltonian and Legendre mechanisms.
To evaluate the rotation of rigid bodies and develop the solution for problems based on rotational motion.

UNIT I: Laws of Motion and Momentum **(15 Hours)**

Classical Mechanic Space and Time - Mass and Force - Newton's First and Second Laws; Inertial Frame - The Third Law and Conservation of Momentum - Newton's Second Law in Cartesian Coordinates - Two-Dimensional Polar Coordinates - conservation of Momentum - Rocket - The Center of Mass - Angular Momentum for a Single Particle - Angular Momentum for several particles.

UNIT II: Energy **(15 Hours)**

Kinetic Energy and Work - Potential Energy and Conservative Forces - Force as the Gradient of Potential Energy - The Second Condition that Force be Conservative - Time-Dependent Potential Energy - Energy for Linear One-Dimensional Systems - Curvilinear One-Dimensional Systems - Central Forces - Energy of Interaction of Two Particles - The Energy of a Multiparticle System.

UNIT III: Lagrange's Equations **(15 Hours)**

Lagrange's Equations for Unconstrained Motion - Constrained Systems; Examples - Constrained Systems in General - Proof of Lagrange's Equations with Constraints - Examples of Lagrange Equations - Generalized Momenta and Ignorable Coordinates - Lagrange's Equations for Magnetic Forces - Lagrange Multipliers and Constraint Forces.

UNIT IV: The Calculus of Variations and Hamilton's Principle **(15 Hours)**

Some typical minimization problems - The Euler-Lagrange equation - Variational principles - Hamilton's principle - Systems of first order ODEs - Legendre transforms - Hamilton's equations - Hamiltonian phase space ((q, p)-space) - Liouville's theorem and recurrence.

UNIT V: Rotational Motion of Rigid Bodies **(15 Hours)**

Properties of the Center of Mass - Rotation about a Fixed Axis - Rotation about Any Axis: the Inertia Tensor - principal Axes of Inertia - finding the Principal Axes: Eigenvalue Equation - Precession of a Top due to a Weak Torque - Euler's Equations - Euler's Equations with Zero Torque - Euler Angles - Motion of a Spinning Top.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Books for Study

1. John, R. T. (2005). *Classical mechanics*. University Science Books. Edwards Brothers.
2. Gregory, D. R. (2006). *Classical Mechanics an Undergraduate text*. Cambridge University Press.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	1,3	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 3.1, 3.2, 3.3, 3.4, 3.5
II	1	4	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10
III	1	7	7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.9, 7.10
IV	2	13,14	13.1, 13.2, 13.3, 13.4, 14.1, 14.2, 14.3, 14.4, 14.5
V	1	10	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10

Books for Reference

1. Goldstein. H., Poole. C.P., Safko J.L. (2002), *Classical Mechanics* (3rd Ed.). Pearson Education.
2. Joag P.S., Rana N.C. (1991), *Classical Mechanics*, McGraw Hill.
3. Raychaudhuri, A.K. (1983), *Classical Mechanics: A Course of Lectures*, Oxford University Press.
4. Upadhaya, J.C. (2022), *Classical Mechanics* (3rd Ed.). Himalaya Publishing House.

Websites and eLearning Sources*

1. https://plato.stanford.edu/entries/newton-stm/
2. https://www.texasgateway.org/resource/74-conservative-forces-and-potential-energy
3. https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Classical_Mechanics_(Tatum)/04%3A_Rigid_Body_Rotation/4.05%3A_Euler's_Equations_of_Motion

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire the knowledge on the fundamental quantities of a dynamic system using Lagrangian, Hamiltonian and Eulerian formalism.	**K1**
CO2	understand the concept of Force, Energy, and momentum of dynamic system by comparing Newtonian, Lagrangian and Hamiltonian formalism and culminate the accurate solution for complex problems in dynamic system.	**K2**
CO3	apply the variation principle to minimize the problem and find the simple solution in Hamiltonian space.	**K3**
CO4	analyze motion of a particle under the central force and establish canonical and conjugate momentum is conserved in conservative system.	**K4**
CO5	evaluate the rotation, oscillation and linear motion of rigid bodies and develop the solution for problems based on Lagrangian, Hamiltonian and Eulerian formalism.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**23UPH53ES02A**			**Discipline Specific Elective - 2:** Classical Mechanics						**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	3	2	3	2	3	2	1	**2.3**
CO2	3	3	2	2	2	3	2	2	2	1	**2.2**
CO3	3	2	2	3	2	2	3	3	2	1	**2.3**
CO4	3	2	2	3	3	2	2	3	2	1	**2.3**
CO5	3	3	2	2	3	2	2	3	2	1	**2.3**
										Mean Overall Score	**2.28 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53ES02B	**Discipline Specific Elective - 2:** Solid State Physics	5	3

Course Objectives
To understand the electronic and crystalline attributes of solid materials.
To study crystal structure, bonding in crystals, specific heat and superconductivity.
To examine the structure and models of nucleus and also to study the process of radioactivity and its applications and also.
To analyse the working of detectors, accelerators and cosmic rays.
To study the aspects related to elementary particle and space physics.

UNIT I: Crystal Structure and X-Ray Diffraction **(15 Hours)**

The Crystalline State - Basic Definitions - Bravais lattices and crystal systems - Symmetry - Miller indices - Crystal structures: FCC, BCC, NaCl, Diamond - Interatomic Forces - Types of Bonding - Bragg's Law - The reciprocal lattice - first Brillouin zone - Experimental X-ray diffraction Techniques: The Rotating - Crystal Method, The Laue Method, The Powder Method.

UNIT II: Lattice Vibrations and Free-Electron Model **(15 Hours)**

Elastic waves - Density of states of a continuous medium - Specific heat: Einstein and Debye models - the phonon - The free electron theory: electrical conductivity - heat capacity of conduction electrons - the Fermi surface - Effects of fermi surface: electrical and thermal conductivity - The Hall effect - Failure of the free electron model.

UNIT III: Semiconductors **(15 Hours)**

Band theory of solids - The Bloch theorem: Bloch function, energy bands and energy gap, crystal potential - Brillouin zones - number of states in a band - Classification of solids - Effective mass - The Hole - Semiconductor band structure - Carrier concentration: Fermi-Dirac function, derivation - Impurity states - Semiconductor statistics: intrinsic and extrinsic regions - Electrical conductivity: mobility and temperature dependence- the Hall effect.

UNIT IV: Dielectric and Optical Properties **(15 Hours)**

Introduction - polarizability - the local field - Maxwell and Lorentz fields - Clausius-Mosotti relation - Sources of polarizability - Dipolar polarizability - Dipolar polarization in solids - Ionic polarizability - Electronic polarizability: Classical treatment - Piezoelectricity - Ferroelectricity: Curie-Weiss law - the microscopic model - Ferroelectric domains.

UNIT V: Magnetic Properties and Superconductivity **(15 Hours)**

Magnetic susceptibility - classification of materials - Langevin theory of diamagnetism - paramagnetism: classical theory - Ferromagnetism - antiferromagnetism and Ferrimagnetism - Ferromagnetic domains: magnetization process - Superconductivity - zero resistance - The Meissner effect - critical field - BCS theory - Josephson effect - Type I and II superconductors.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Book For Study

1. Omar, M.A. (2010). *Elementary Solid State Physics*. Pearson India.

UNIT	BOOK	CHAPTER	SECTION
I	1	1 & 2	1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.9, 1.10, 2.3, 2.6, 2.9,
II	1	3 & 4	3.2, 3.3, 3.4, 3.5, 4.3, 4.4, 4.6, 4.7, 4.8, 4.9, 4.10, 4.13
III	1	5 & 6	5.2, 5.3, 5.4, 5.5, 5.10, 5.15, 5.17, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8
IV	1	8	8.2, 8.3, 8.4, 8.5, 8.7, 8.8, 8.9, 8.10, 8.11
V	1	9 & 10	9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.11, 10.2, 10.3, 10.4, 10.7, 10.8,10.9

Books for Reference

1. Ashcroft, N. W., & Mermin, N. D. (1976). *Solid State Physics.* Brooks/Cole; New edition.
2. Kittel, C. (2019). *Introduction to Solid State Physics,* (India Edition). Wiley.
3. Simon, S. H. (2013). *The Oxford Solid State Basics.* Oxford University Press.
4. Holgate, S. A. (2010). *Understanding Solid State Physics*. CRC Press.

Websites and eLearning Sources

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html
4. http://www.umop.net/spectra/spectrum.php?elem=H&sw=430&lw=710

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	remember the knowledge of Crystal structures, free electron model, band structure, dielectric properties and superconductivity.	**K1**
CO2	understand and describe the different experimental X-ray diffraction methods and lattice vibration, free-electron, band theories of solids.	**K2**
CO3	apply the theories underlying dielectric, optical, magnetic and superconductive properties.	**K3**
CO4	analyse the properties of semiconductors, dielectrics, optical, magnetic and superconductive materials.	**K4**
CO5	evaluate the theories to explain the properties of solids.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**23UPH53ES02B**			**Discipline Specific Elective - 2:** Solid State Physics						**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	2	2	3	2	2	2	2	**2.3**
CO2	3	3	3	2	2	3	2	2	2	2	**2.4**
CO3	3	3	2	2	2	3	3	2	2	1	**2.3**
CO4	3	3	3	2	2	3	3	2	2	1	**2.4**
CO5	3	3	2	2	2	3	3	2	1	1	**2.2**
										Mean Overall Score	**2.32 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	23UPH53SP01	**Self-paced Learning:** Astronomy	-	2

Course Objectives
To describe the geology of the Moon and to explain several theories of the Moon's formation.
To explain what a solar eclipse is and to state the difference between a total solar eclipse and partial lunar eclipse and also to describe how the Sun, Moon, and Earth must be aligned for a solar eclipse to occur.
To summarize the methods and techniques of astronomical imaging.
To articulate the various planets in the solar system and to determine the position of the planets from the sun and also to describe the properties of different planets and classify them into rocky and gassy.
To illustrate the solar calendar whose dates indicate the season or almost equivalently the apparent position of the Sun relative to the stars.

UNIT I: The Moon

Introduction - Sidereal month - Synodic month - daily motion of the moon - age of moon - phase of moon - position of moon at rising and setting.

UNIT II: Eclipses

Introduction - umbra and penumbra - lunar eclipse - solar eclipse - duration of lunar and solar eclipse - comparison of solar and lunar eclipses.

UNIT III: Astronomical Instruments

Sidereal clock - chronometer - gnomon - sun dual - the heliometers - the sextant - chronograph - radio telescope.

UNIT IV: Solar System

Introduction - the Sun - Mercury - the Venus - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto.

UNIT V: The Calendars

Lunar and Solar calendars - Egyptian - Mayan - Roman - Julian and Gregorian calendars - Indian National calendar - Tamil and Malayalam calendars.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Book for Study

1. S. Kumaravelu, Susheela Kumaravelu. (2013). *Astronomy*, (Revised Ed.)

Books for References

1. Bhatia, V.B. (2001). *Text book for Astronomy and Astrophysics with elements of Cosmology*, (2nd Edition). Narosa Publishing House.
2. Karttunen, H., Kroger, P., Oja, H., Poutanen, M., & Donner, D. J. (2007). *Fundamental Astronomy*, (5th Edition). Springer Berlin Heidelberg.

Course Outcomes		
CO No.	CO-Statements On successful completion of this course, the students will be able to	Cognitive Levels (K-Level)
CO1	acquire the knowledge on the solar systems, Eclipses, Lunar and Solar calendars.	K1
CO2	describe the features of an astronomical instruments, a variety of calendars and the planets in the solar systems	K2
CO3	understand the various physical phenomena exercised in the astronomical instruments	K3
CO4	apply astronomical telescopes to examine the features of Moon and plants in the solar systems	K4
CO5	analyse the changes observed in the sky and understand the causes responsible for any observed changes.	K5

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**23UPH53SP01**			**Self-paced Learning:** Astronomy						**-**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	3	2	2	3	3	2	2	**2.5**
CO2	3	2	2	2	2	2	3	2	3	2	**2.3**
CO3	3	2	2	2	2	3	3	2	2	2	**2.3**
CO4	3	2	2	2	2	3	3	2	1	2	**2.2**
CO5	3	3	3	3	2	3	3	3	1	2	**2.6**
Mean Overall Score											**2.38 (High)**

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** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	23UPH63CC09	**Core Course - 9:** Quantum Mechanics	4	4

Course Objectives
To know the fundamental principles and systems in quantum mechanics
To understand the results and phenomena of various quantum mechanical concepts and systems
To apply the basic principles of quantum mechanics on various systems.
To solve various potential problems using Schrodinger theory and general formalisms.
To analyze and investigate various quantum systems using the quantum theory.

UNIT I: The Schrödinger Equation **(12 Hours)**

The principle of superposition - Wave packet - Schrödinger's Equation: 1d equation for a free particle - Operators for momentum and energy - Extension to 3 dimensions - Inclusion of force - Born's interpretation of wave functions: probability interpretation - Probability current density - Normalization - Expectation value - The Ehrenfest theorem. The time - independent Schrödinger equation - Stationary states - Conditions on the wavefunction.

UNIT II: The General Formalism **(12 Hours)**

Hilbert Space - orthogonal functions - Linear Operator - Eigenfunctions and Eigen Values - Hermitian operator - Schmidt orthogonalization procedure - Postulates of quantum mechanics: Wavefunction, operators, expectation value, eigen values, time development of a quantum system - Simultaneous measurability of observables - General uncertainty relation.

UNIT III: Exactly Solvable Problems-I **(12 Hours)**

The zero potential - The step potential (energy less than step height) - The step potential (energy greater than step height) - The barrier potential - Examples of barrier penetration by particles

UNIT IV: Exactly Solvable Problems-II **(12 Hours)**

The square well potential - Analytical solution for square well potential - The infinite square well potential - The simple harmonic oscillator potential - Series solution for a simple harmonic oscillator potential.

UNIT V: The Hydrogen Atom **(12 Hours)**

Introduction - Development of the Schrödinger equation - Separation of the time independent equation - Solution of the equations - Eigenvalues, Quantum numbers and degeneracy - Eigen functions - Probability densities.

Teaching Methodology	Lectures, Presentations, Simulations and Videos

Books for Study

1. Aruldhas, G. (2008). *Quantum mechanics*, (2nd Ed.). PHI Learning Pvt. Ltd.
2. Eisberg, R., & Resnick, R. (2006). *Quantum physics of atoms, molecules, solids, nuclei, and particles*, (2nd Ed.). Wiley.

Unit	Book	Chapters	Sections
I	1	2	2.3, 2.4 2.5, 2.6, 2.7, 2.8, 2.9, 2.10,
II	1	3	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7
III	2	6	6.1, 6.2, 6.3, EX. 6.1, EX 6.2, 6.4, EX 6.3, 6.5, 6.6
IV	2	6	6.7, AP.H, 6.8, EX. 6.5, EX 6.6, 6.9, AP.I, 6.10
V	2	7	7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7

Books for Reference

1. Mathews, P. M., & Venkatesan, K. (2017) *A text book of Quantum mechanics*, (2nd Ed.). Tata McGraw Hill.
2. Bransden, B., & Joachain, C. (2004). *Quantum Mechanics*, (2nd Ed.). Pearson.
3. Griffiths, D. J., & Schroeter, D. F. (2019). *Introduction to Quantum mechanics*, (3rd Ed.). Cambridge University Press.
4. Merzbacher, E. (2011). *Quantum Mechanics*, (3rd Ed.). Wiley.

5. Gasiorowicz, S. (2003). *Quantum Physics*, (3rd Ed.). Wiley.

Websites and eLearning Sources

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. http://www.quantumvisions.net/en/
4. https://vqm.uni-graz.at/
5. https://phet.colorado.edu/en/simulations/filter?subjects=quantum-phenomena&type=html,prototype

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	describe the Schrodinger theory, the fundamental postulates of quantum mechanics and know various potential problems in quantum mechanics.	**K1**
CO2	understand the concepts of Schrodinger equations, the various mathematical formalisms, and different quantum systems.	**K2**
CO3	apply the Schrodinger theory and various principles of quantum mechanics to solve various potential problems and utilize them to interpret different properties.	**K3**
CO4	analyse the consequences of the principles of quantum mechanics and investigate the properties of various quantum systems.	**K4**
CO5	evaluate the principle of quantum theory in addressing various problems and explain its results.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**23UPH63CC09**			**Core Course-9:** Quantum Mechanics						**4**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	3	3	3	2	2	**2.4**
CO2	3	3	2	2	1	3	3	3	2	2	**2.4**
CO3	3	2	2	2	1	3	3	2	2	2	**2.2**
CO4	3	2	2	2	1	2	2	3	2	2	**2.1**
CO5	3	3	2	2	2	3	3	2	2	2	**2.4**
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63CC10	**Core Course -10:** Atomic, Nuclear and Particle Physics	4	4

Course Objectives
To recognize the fundamentals of structure of atoms and nucleus and their properties.
To acquire knowledge about the atomic models and electronic and nuclear structures.
To interpret the concepts of radioactivity and different radioactive decays.
To discuss the idea of the elementary particles, particle accelerators, and detectors
To apply the concepts of atomic and nuclear physics in appropriate junctions.

UNIT I: Atomic Structure **(12 Hours)**

The Nuclear Atom - Rutherford Scattering - Scattering Formula derivation - Electron Orbits - Atomic Spectra - Ritz combination principle - The Bohr Atom - Energy Levels and Spectra - Correspondence Principle - The Sommerfeld Atom - Nuclear Motion - Atomic Excitation.

UNIT II: Electronic Structure of Atoms **(12 Hours)**

Zeeman effect: EM moment - Magnetic energy - Bohr magnetron - Zeeman experiment - Paschen - Back effect - Stark effect - Electron spin - Exclusion Principle - Stern-Gerlach Experiment - The periodic table - Atomic structures - Spin orbit coupling - Total Angular Momentum - LS coupling - X-ray Spectra - Auger effect.

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

Nuclear composition - Nuclear Properties - Stable Nuclei - Binding Energy - the strong - interaction - Liquid drop model - Shell Model - Meson theory of nuclear forces - Nuclear Matter - two nucleon potential.

UNIT IV: Nuclear Transformations **(12 Hours)**

Radioactive decay - Half life - Radioactive series - Alpha decay: Tunnel theory (alpha decay constant derivation) - Beta decay - Gamma - decay - Cross section - Nuclear reactions - Nuclear fission - Nuclear reactors - Nuclear fusion in stars - Fusion reactors.

UNIT V: Particle Detectors, Particle Accelerators and Elementary Particles **(12 Hours)**

Particle Detectors: Wilson Cloud chamber - ionization chamber - Geiger Muller Counter - solid state detectors. **Particle Accelerators**: Cyclotron - Betatron - Synchrotron - electron synchrotron and proton synchrotron. **Elementary Particles:** Interactions and particles - Leptons - Hadrons - Elementary Particle Quantum numbers - Quarks - Field Bosons.

Teaching Methodology	Chalk and talk method, Demonstrations, Presentations and Videos.

Books For Study

1. Besier., Mahajan, S., & Choudhury, S. R. (2017). *Concepts of Modern Physics*, (7th Ed.). McGraw Hill Education.
2. Kolanoski. H., & Wermes, N. (2020). *Particle Detectors*. Oxford University Press.
3. Kaplan, I. (1977). *Nuclear Physics*, (2nd Ed.). Addison-Wesley.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	4	4.1, 4.2, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9
II	1	6 7	6.10, 6.11 7.13, 7.14, 7.1, 7.2, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10
III	1	11	11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.9
IV	1	12	12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 12.10, 12.11, 12.12
V	2 3 1	6, 7, 8 21 13	6.1, 7.2.1, 7.2.2, 7.6.2, 8.1 21.3, 21.4, 21.5, 21.6 13.1, 13.2, 13.3, 13.4, 13.5, 13.6

Books for Reference

1. Eisberg, R., & Resnick, R. (2006). *Quantum physics of atoms, molecules, solids, nuclei, and*

particles. (2nd Ed.). Wiley.
2. Serway, R. A., Moses, C. J., & Moyer, C. A. (2004). *Modern Physics*, (3rd Ed.). Brooks/Cole Publications.
3. Mathews, P. M., & Venkatesan, K. (2017). *A text book of Quantum mechanics*, (2nd Ed.). Tata McGraw Hill.
4. Semat, H., & Albright, J. R. (1985). *Introduction to Atomic and Nuclear Physics*, (5th Ed.). Chapman and Hall.

Websites and eLearning Sources

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html
4. http://www.umop.net/spectra/spectrum.php?elem=H&sw=430&lw=710

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire the knowledge on the structure of atom and nucleus using different models.	**K1**
CO2	understand the properties of atom under external field, radioactive decay, nuclear reactions, and experimental methods to detect and accelerate particles.	**K2**
CO3	interpret the atomic spectra and periodic table based on the atomic models.	**K3**
CO4	classify elementary particles based on various physical properties.	**K4**
CO5	summarize the applications of atomic and nuclear physics.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**23UPH63CC10**			**Core Course -10:** Atomic, Nuclear and Particle Physics						**4**	**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	3	2	2	3	2	2	2	2	**2.4**
CO2	3	3	3	2	2	3	2	2	2	2	**2.4**
CO3	3	3	3	2	2	3	3	2	2	2	**2.4**
CO4	3	3	3	2	2	3	3	2	2	2	**2.4**
CO5	3	3	3	2	2	3	3	2	2	2	**2.4**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63CP05	**Core Practical - 5:** Physics Practical - 5	**6**	**2**

Any 16 Experiments

1. Monostable and Bistable multivibrators – construction and study
2. Spectrometer – Cauchy's constant.
3. Spectrometer – Small angle prism.
4. B.G. – Inductance by Anderson's bridge.
5. B.G. – High resistance by leakage.
6. Potentiometer – EMF of a thermocouple.
7. Potentiometer – High range voltmeter.
8. Series and parallel resonance circuits.
9. NAND and NOR as universal building blocks.
10. Adders and Subtractors - construction and study
11. Op-amp – study of basic operations.
12. Astable multivibrator using Transistors - construction and study.
13. Simplification of Boolean expression using k map and implementation.
14. Encoder and Decoder - construction and study.
15. Binary adder and subtractor - construction and study.
16. Multiplexer and Demultiplexer - construction and study.
17. Flip Flops using logic gates - construction and study.
18. 4-bit Shift registers – SISO, SIPO and PISO - construction and study
19. 3 bit synchronous and asynchronous counters - construction and study.
20. V-I characteristics of Solar panel.
21. C Programs – Basics
22. C Program - Application to physics problem
23. Arduino basic programs
24. DC voltmeter using Arduino
25. Calculator using Arduino and 4x4 key pad
26. Stepper motor control using Arduino
27. Light intensity measurement using Arduino
28. Resistance measurement using Arduino
29. Capacitance measurement using Arduino
30. Study characteristics of sensors (any three like pressure, position, distance, motion, etc.,)
31. Wave length of laser using spectrometer
32. Determination of Boltzmann constant using V-I characteristic of PN diode
33. Determination of the Coupling Coefficient of a Piezoelectric crystal.
34. Diameter of a wire using laser
35. Study of AM and FM

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63ES03A	**Discipline Specific Elective - 3:** Statistical Mechanics	5	3

Course Objectives
To recognize fundamental ideas of Statistical thermodynamics and its laws.
To understand the concepts of Classical and Quantum statistics.
To interpret the molecular distribution of gas system based on Maxwell-Boltzmann statistics.
To compare the Classical Statistics and Quantum Statistics.
To evaluate the Bose-Einstein Statistics and Fermi-Dirac Statistics in the case of photon gas and electron gas respectively.

UNIT I: Statistical Thermodynamics **(15 Hours)**

Macroscopic and Microscopic states - phase space - statistical interpretation of entropy - partition function and thermodynamic properties of systems -partition function for an ideal monoatomic gas: single particle and N-particle partition function, thermodynamic variables - mixing of two different ideal gases - Gibbs Paradox - Sackur Tetrode equation - Law of equipartition of energy - applications-specific heat and limitations.

UNIT II: Classical Statistics of Maxwell Boltzmann **(15 Hours)**

Maxwell - Boltzmann distribution law - distribution law of molecular speeds - specific heat capacity of gases - partition function of diatomic molecule: specific heat capacity of diatomic molecule, specific heat capacity of Hydrogen, thermodynamic functions of a two-energy levels system - negative temperature.

UNIT III: Quantum Statistics **(15 Hours)**

Gibbs factor: Carbon monoxide poisoning - Bosons and Fermions - Bose-Einstein distribution law - Fermi Dirac distribution law, degenerate Fermi gases - zero temperature - small non- zero temperature - density of states - Sommerfeld expansion, Blackbody radiation: ultraviolet catastrophe, Planck's distribution, Photons, summing over modes, Planck's spectrum, total energy, entropy of a photon gas, cosmic background radiation, photons escaping through a hole.

UNIT IV: Bose-Einstein Statistics **(15 Hours)**

Bose-Einstein distribution law, strongly degenerate Boson gas: Bose-Einstein condensation in ultra-cold atomic gases - Thermodynamic functions of photon gas, Applications of Bose - Einstein statistics to Blackbody radiation.

UNIT V: Fermi-Dirac Statistics **(15 Hours)**

Fermi-Dirac distribution law - ideal quantum gases: particle distribution and internal energy, weakly degenerate quantum systems - completely and strongly degenerate Fermi gas - Fermi energy - electron gas in a metal, application of Fermi-Dirac statistics - thermionic emission, photoelectric emission ultra-cold atomic Fermi gases.

Teaching Methodology	Lectures, Demonstrations, Presentations and Videos

Books for Study

1. Garg, S C., Bansal, R. K., & Ghosh, C. K. (2013). *Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics,* (2nd Ed.). McGraw Hill Education India.
2. Daniel, V. S. (2014). *An introduction to thermal physics,* (1st Ed.). Pearson Education India.

Unit	Book	Chapters	Sections
I	1	1, 12, 13	12.1, 12.2, 12.3, 12.5, 12.8, 12.9, 13.2, 13.3, 13.4, 1, 4
II	1	12, 13	12.9, 13.4, 13.6, 13.6.1, 13.7
III	2	7	7.1, 7.2, 7.3, 7.4, 7.5, 7.6
IV	1	15	15.1, 15.2, 15.3
V	1	14	14.1, 14.2, 14.3, 14.4, 14.5

Books for Reference

1. Pathria, R. K., & Heinemann, B. (1996). *Statistical Mechanics,* (2nd Ed.). Oxford University

Press.
2. Reif, F. (2008). *Berkeley Physics Course- Statistical Physics*. Tata McGraw-Hill.
3. Sears, F. W., & Salinger, G. L. (1982), *Thermodynamics, Kinetic Theory, and Statistical Thermodynamics*, (3rd Ed.). Addison-Wesley Publishing Company.

Websites and eLearning Sources

1. https://web.mit.edu/16.unified/www/SPRING/propulsion/notes/node55.html
2. https://openstax.org/books/university-physics-volume-2/pages/2-4-distribution-of-molecular-speeds
3. https://scholar.harvard.edu/files/schwartz/files/10-quantumstatmech.pdf
4. http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/disbe.html
5. http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/disfd.html

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	acquire the knowledge about macroscopic and microscopic systems with a description of temperature, entropy, and free energy.	**K1**
CO2	understand the classical statistics and the applications of Maxwell-Boltzmann distributions.	**K2**
CO3	apply the quantum statistics to photon gas and electron gas.	**K3**
CO4	analysis the strength and limitations of the different microscopic models and be able to compare different microscopic models.	**K4**
CO5	evaluate weakly degenerate quantum systems, completely and strongly degenerate Fermi gas.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**23UPH63ES03A**			**Discipline Specific Elective - 3:** Statistical Mechanics						**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	3	2	3	3	2	2	1	**2.3**
CO2	2	3	2	3	2	3	3	2	3	1	**2.4**
CO3	3	2	2	3	2	3	3	3	2	1	**2.4**
CO4	3	3	2	3	2	2	2	3	2	1	**2.2**
CO5	3	2	2	2	2	3	3	2	2	1	**2.2**
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63ES03B	**Discipline Specific Elective - 3:** Spectroscopy and Laser	5	3

Course Objectives
To understand the concepts of Dispersion of Light classification of molecules
To study the principles of Raman and Resonance Spectroscopy and its applications.
To analyse the principles of MW, ESR Spectroscopy and its applications
To examine the working principle of Lasers, and their applications
To study different types of optical fiber and its applications.

UNIT I: Microwave and Infrared Spectroscopy **(15 Hours)**

Electromagnetic spectrum - Types of molecular energies - Different spectroscopic methods - Rotational spectra: Classification of molecules - Interaction of radiation with rotating molecule - Rigid diatomic molecules - Microwave spectrometer - Information derived from rotational spectra - IR Spectroscopy - Vibrational energy - IR spectra preliminaries - Vibrations of polyatomic molecules: Normal vibrations of CO_2 and H_2O molecules - Dipole moment - IR spectrometer

UNIT II: Raman and Laser Spectroscopy **(15 Hours)**

Raman Spectroscopy: Theory of Raman scattering: Classical and quantum - Mutual exclusion Principle - Raman spectrometer - Fourier transform Raman spectrometer - resonance Raman scattering - Laser spectroscopy - Nonlinear optical effects - frequency generation - Hyper Raman effect - stimulated Raman scattering - Inverse Raman scattering - Coherent anti-stoke Raman scattering - Multi-photon processes.

UNIT III: Electronic and Spin Resonance Spectroscopy **(15 Hours)**

Electronic spectroscopy: Introduction - Dissociation - Pre-dissociation - Electronic angular momentum - Photoelectron spectroscopy: Principle - Instrumentation - information from photoelectron spectra - Nuclear Magnetic Resonance: Magnetic properties of nuclei - Resonance condition - Instrumentation - relaxation process - Chemical shift - Electron spin resonance: Introduction - Principle - ESR spectrometer - Nuclear Quadrupole resonance (Principle).

UNIT IV: Principles of Laser **(15 Hours)**

Absorption and emission of light - Stimulated absorption - Spontaneous and stimulated emission - difference between spontaneous and stimulated emission - Einstein Relations - condition for stimulated emission - Condition for light amplification - Population inversion - Pumping methods and schemes - Metastable states - Optical resonator and its action - Characteristics of laser - Two level and three level laser systems.

UNIT V: Types and Applications of Lasers **(15 Hours)**

Classification of lasers - solid state lasers: Ruby - Nd:YAG - Gas lasers: He-Ne- CO_2 - Semiconductor lasers: population inversion - pn-junction - lasing condition - Homojunction laser - Heterojunction lasers - Applications: LIDAR - Holography: Principle and method - Bar code reader - Medical and engineering applications.

Teaching Methodology	Lectures, Demonstrations, Presentations and Videos

Books for Study

1. Aruldhas, G. (2008). *Molecular Structure and Spectroscopy*, (2nd Ed.). PHI learning.
2. Avadhanulu, M. N., & Memne, P. S. (2012). *An introduction to Lasers*. S. Chand.

UNIT	BOOK	CHAPTER	SECTION
I	1	1, 6 & 7	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.14, 6.15, 7.1, 7.2, 7.7, 7.7.1, 7.7.2, 7.16
II	1	8 & 15	8.1, 8.2, 8.5, 8.6, 8.9, 8.16, 15.1, 15.2, 15.5, 15.6, 15.7, 15.8, 15.10
III	1	9, 10, 11 & 12	9.1, 9.9, 9.10, 9.11, 9.12, 10.1, 10.2, 10.3, 10.5, 10.8, 11.1, 11.2, 11.3, 12.1, 12.2
IV	2	1	1.18, 1.20, 1.21, 1.22, 1.23, 1.27, 1.28, 1.29, 1.31, 1.32, 1.35, 1.36
V	2	2 & 5	2.2, 2.3, 2.3.1, 2.3.2, 2.4, 2.4.1, 2.4.3, 2.7, 2.7.3, 2.7.4, 2.7.5, 2.7.13, 2.7.14, 5.17, 5.20, 5.21.1

Books for Reference

1. Svanberg, S. (2004). *Atomic and Molecular Spectroscopy*. Springer-Verlag.
2. Hollas, J.M. (2002). *Basic Atomic and Molecular Spectroscopy*. Royal Society of Chemistry.
3. Banwell, C. (2017). *Fundamentals of Molecular Spectroscopy*, (4th Ed.). McGraw Hill Education.
4. Thyagarajan, K., & Ghatak, A. (2010). *Lasers*, (2nd Ed.). Springer.

Websites and eLearning Sources

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. https://edu.rsc.org/resources/analysis
4. https://www.rp-photonics.com/laser_physics.html

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	know the basic concepts indifferent spectroscopic methods, MW, IR and Raman Spectroscopy and fundamental of laser.	**K1**
CO2	understand the different physical phenomena in various spectroscopic techniques, principles of Laser and types.	**K2**
CO3	explain the theory, principles, different types of Spectroscopy and Laser.	**K3**
CO4	analyse the various experimental techniques in different spectroscopies and different types of laser models.	**K4**
CO5	evaluate the spectroscopy methods based on interaction of light with matter and classify lasers and its application.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**23UPH63ES03B**			**Discipline Specific Elective - 3:** Spectroscopy and Laser						**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	2	2	3	2	2	1	2	**2.2**
CO2	3	3	3	2	2	3	2	2	1	1	**2.2**
CO3	3	3	2	2	2	3	3	2	1	1	**2.2**
CO4	3	3	3	2	2	3	3	2	1	1	**2.3**
CO5	3	3	2	2	2	3	3	2	1	2	**2.3**
										Mean Overall Score	**2.24 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63ES04A	**Discipline Specific Elective - 4:** Embedded System and Microcontroller	5	3

Course Objectives
To recognize the structure of C language, AVR microcontroller and Arduino programming.
To understand the basics of C language, microcontroller and programming.
To apply the programming language and microcontroller to in embedded system for various applications.
To analyse the performance of embedded systems of simple applications.
To evaluate the need of embedded systems for automation.

UNIT I: C Language **(15 Hours)**

Structure of C language - C character set - constants - keywords - variables - data types and sizes - Arithmetic operators - relational operators - logical operators - assignment operators - increment and decrement operators - conditional operator - bitwise operators - special operators - arithmetic expressions - evaluation of expressions - precedence of arithmetic operators - variable declaration - labels - statements - input functions - output functions - formatted input/output - Unconditional control - bidirectional conditional control - multi conditional control - loop control structures - Arrays - Functions - simple programs.

UNIT II: The AVR Microcontroller **(15 Hours)**

AVR Atmega328P - Features - Block diagram - architecture - CPU core - ALU - Status register - General purpose register - Stack pointer - Instruction execution timing - Reset and Interrupt handling - AVR memories - In-System Reprogrammable Flash Program Memory - SRAM Data Memory - EEPROM Data Memory - I/O Memory - Register Description - Fuse bits - System Clock and Clock Options - Low Power Crystal Oscillator - Calibrated Internal RC Oscillator - Power Management and Sleep Modes.

UNIT III: Arduino IDE and AVR Programming **(15 Hours)**

Embedded System - Boot Loader - Arduino IDE - Installing IDE - Description - Commands - LOAD - interfacing and programming LED, LCD, Keypad and Relay.

UNIT IV: AVR Peripheral Programming **(15 Hours)**

Analog Comparator - ADC - Interrupts - Timers - Volt, Current, Resistance, Capacitance and conductivity measurement - light intensity measurement - interrupt program - delay using timer - counter using timer/counter.

UNIT V: Communication Protocols **(15 Hours)**

SPI - Serial Peripheral Interface - USART - 2-wire Serial Interface (I2C) - Simple programs: serial monitor - I2C LCD.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Books for Study

1. (2016). *The C Programming Language*. Easy Programming Publisher
2. (2019). *ATmega328P DATASHEET*.Text Prepared by the Department (Arduino Reference)

Unit	Book	Chapters	Sections
I	1	2-9	All
II	2	1-5	All
III	3	1	All
IV	3	2	All
V	3	3	All

Book for Reference

1. Mazidi, M.A., Naimi, S., & Naimi, S., (2012), *The AVR Microcontroller and Embedded System*. Pearson Prentice Hall.

Websites and eLearning Sources

1. https://www.arduino.cc/
2. https://www.totalphase.com/blog/2020/12/differences-between-embedded-system-vsmicrocontroller/
3. https://www.tutorialspoint.com/embedded_systems/es_microcontroller.htm

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	acquire the knowledge on fundamentals of c-programming and explain C programs for embedded systems and microcontrollers	**K1**
CO2	predict the automatic solutions and complete the embedded system for day-to-day activities.	**K2**
CO3	identify the suitable microcontroller along with appropriate interfacing circuits and use the same for an application with C program.	**K3**
CO4	assess the global need of the embedded system and recommend solutions by inventing the circuits.	**K4**
CO5	select the features of microcontrollers and evaluate the embedded system for social needs.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
6	**23UPH63ES04A**	**Discipline Specific Elective - 4:** Embedded System and Microcontroller								**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	2	2	3	3	3	3	2	**2.7**
CO2	3	3	3	2	2	3	3	3	3	2	**2.7**
CO3	3	3	3	2	2	3	3	3	3	2	**2.7**
CO4	3	3	2	2	2	3	3	3	3	2	**2.6**
CO5	3	3	2	2	2	3	3	3	3	2	**2.6**
										Mean Overall Score	**2.66 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63ES04B	**Discipline Specific Elective - 4:** Sensors, Transducers and IoT	5	3

Course Objectives
To describe the principles of sensors, transducers and IoT
To understand the principle and working of sensors, transducers and IoT
To apply the basic working characteristics of sensor and transducer in different measuring applications
To analyse the performance of sensors and transducers in IoT applications
To evaluate the working of IoT applications

UNIT I: Analog and Digital Sensor **(15 Hours)**

Resistive - Capacitive - Voltage-Generating - Hall effect Sensor - LVDT - Load cell - Ionizing Radiation Sensors - Electrochemical Sensors - Mechano-Optical Sensors - Temperature sensor - DS1820.

UNIT II: Strain, Pressure, Position, Distance and Motion Transducers **(15 Hours)**

Accelerometer - Magnetometer - Gyro Sensor - Pressure Sensor - Rotation - Smart sensor - Sound - Gravitational Sensing - Sensor Fusion.

UNIT III: Sensor, Transducer Application Circuit Design **(15 Hours)**

Digital filters - Volt, Current, Resistance, Capacitance, Inductance, magnetic Field, Distance, Position, Temperature meters.

UNIT IV: IoT Architecture and Platforms **(15 Hours)**

Internet of Things - Importance - Architecture - IoT data - MQTT protocols - Industrial IoT - Security - Applications.

UNIT V: IoT Weather Forecasting Station - Case Study **(15 Hours)**

Temperature and humidity by using the DHT11 sensor - Wind speed using an Anemometer - Light intensity using an LDR - Carbon monoxide levels in the air using MQ7 - Soil moisture using Hygrometer - Ultrasonic sensor for rain water level - Raindrop sensor for detecting rainfall or snow fall - System Architecture - Analysis.

Teaching Methodology	Demo Videos, PPT, Handouts, Study materials

Books for Study

1. Usher, M. J., & Keating, D. A. (1996). *Sensors and Transducers, (*2nd Ed.). Palgrave Macmillan.
2. Serpanos, D., & Wolf, M. (2018) *Internet of Things (IoT) Systems, (*1st Ed.). Springer International Publishing.
3. Text Prepared by Department.

0	Book	Chapters	Sections
I	1	1, 2, 3, 5, 6	1.3-1.6, 2.2, 2.5, 3.2, 5.2, 5.3, 5.4, 6.2, 7.2
II	1	11	Relevant sections
III	1	8	Relevant sections
IV	2	1, 2, 5	1.1-1.6, 2.1-2.6, 5.1-5.6
V	3	All	

Books for Reference

1. Sinclair, I. (2000). *Sensors and Transducers,* (3rd Ed.). Newnes.
2. Toronto, B. S. L. (2000). *Sensors & Transducer*. IFSA Publishing.

Websites and eLearning Sources

1. https://www.electronics-tutorials.ws/io/io_1.html
2. https://www.variohm.com/news-media/technical-blog-archive/difference-between-asensor-and-a-transducer
3. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K - Level)**
CO1	describe and discuss the analog and digital sensors, its applications, IOT Architecture and Platforms.	**K1**
CO2	classify the sensors and transducers and identify its applications.	**K2**
CO3	list various sensors and use them to identify different physical parameters.	**K3**
CO4	assess the global need of the IoT system and recommend solutions by designing the circuits.	**K4**
CO5	find the suitable sensors and transducers, and evaluate the IoT projects.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
6	**23UPH63ES04B**	**Discipline Specific Elective - 4:** Sensors, Transducers and IoT								**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	2	2	3	3	2	2	2	**2.5**
CO2	3	3	2	2	2	3	3	3	3	2	**2.6**
CO3	3	3	2	2	2	3	3	3	2	2	**2.5**
CO4	3	3	2	2	2	3	3	3	2	2	**2.5**
CO5	3	3	2	2	2	3	3	3	2	2	**2.5**
Mean Overall Score											**2.52 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	23UPH63CE01	Comprehensive Examination*	-	2

UNIT I: Mechanics and Properties of Matter

Kinematics and Dynamics - Work and Energy - Conservation of Linear and Angular momentum - Dynamics of rigid bodies - Inverse square law force - Elasticity - Viscosity - Surface tension – Diffusion - osmosis and low pressure.

UNIT II: Mathematical Physics

Matrices - Vector calculus - Differential equation - Multiple integrals - Fourier series - Errors, approximations and extremum of functions - Special functions - Laplace transforms and its applications - Complex analysis - Numerical methods.

UNIT III: Electromagnetism and Thermal Physics

Electrostatics - Electric field in matter - Magnetostatics - Magnetostatic field in matter -Electrodynamics - Laws of thermodynamics - Thermodynamic potential and phase transitions - Thermal properties of solids - Thermodynamical behavior of real gas - Advanced thermodynamics.

UNIT IV: Concepts of Modern Physics and Quantum Mechanics

Special theory of relativity - Particle properties of waves - Wave properties of particles - Cosmology and nano science - Time dependent Schrodinger equation - Time independent Schrodinger equation and formalism - Exactly solvable quantum system - The hydrogen atom.

UNIT V: Optics, Atomic Nuclear and Particle Physics

Geometrical optics - The matrix method - Wave optics - Diffraction and Polarization - Optical fiber - Atomic structure - Electronic structure of atoms - Nuclear structure - Nuclear transformations - Detectors, accelerators and elementary particles.

Book for Study

1. Text by the Department

Books for Reference

1. Maithi, S.N., & Raychaudhuri, D.P. (2008). *Classical Mechanics and General Properties of Matter*. New Age International Publishers.
2. Kleppner., & Kolenkow. (2017). *An Introduction to Mechanics*, (1st Ed.). McGraw Hill Education.
3. Kreyszig, E. (2010). *Advanced Engineering Mathematics*, (9th Ed.). Wiley.