B Sc BOTANY

LOCF SYLLABUS 2025

Department of Botany

School of Biological Sciences

St. Joseph's College (Autonomous)

Tiruchirappalli - 620002, Tamil Nadu, India

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

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

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

The overarching objectives of these five schools are as follows:

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

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

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

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

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

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

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

Credit system

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

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

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

OUTCOME-BASED EDUCATION (OBE)

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

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

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

Here are some key aspects of Outcome-Based Education:

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

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

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

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

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

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

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

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

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

Some Important Terminologies

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Course Coding

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

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

Course Specific Initials

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

EVALUATION PATTERN (UG)
Continuous Internal Assessment

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

Passing minimum: 40 marks

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

Question Paper Blueprint for Mid and End Semester Tests

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

***** *Compulsory*

Question Paper Blueprint for Semester Examination

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

***** *Compulsory*

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

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

Grading System

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

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

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

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

Where,

Ci - credit earned for the Course i

Gpi - Grade Point obtained for the Course i

Mi - Marks obtained for the Course i

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

WAM - Weighted Average Marks

Classification of Final Results

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

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

Table - 1: Grading of the Courses

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

Table - 2: Grading of the Final Performance

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

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

Vision

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

Mission

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

Programme Educational Objectives (PEOs)

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

Programme Outcomes (POs)

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

Programme Specific Outcomes (PSOs)

1. Graduates will acquire the basic concepts to utilize them for lifelong learning, communicative skills and to imbibe ethical values to create a better world.
2. Graduates will learn about the systematics, structure and functions of plants for effective management of cultivation practices for improved plant performance.
3. Graduates will develop laboratory skills utilizing modern tools, techniques and protocols to collect and process data to design innovative scientific problems and solutions.
4. Graduates will apply the skills for the benefit of the society through teamwork and project management practices for employability and entrepreneurship.
5. Graduates will exploit the knowledge gained through various courses for sustainable environment and human welfare.

B. Sc. Botany					
Programme Structure					
Part	**Semester**	**Specification**	**No. of Courses**	**Hours**	**Credits**
1	1- 4	Languages (Tamil / Hindi / French / Sanskrit)	4	16	12
2	1 - 4	General English	4	20	12
3	1 - 6	Core Course	12	58	47
	1 - 6	Core Practical	8	24	8
	1 & 2	Allied Course	2	8	6
	1 & 2	Allied Practical	2	4	2
	3 & 4	Allied Optional	2	8	6
	3 & 4	Allied Optional Practical	1	4	2
	5 & 6	Discipline Specific Elective	4	16	12
	5	Internship	1	-	1
	6	Project / Industrial Visit / Field Visit	1	-	1
	6	Comprehensive Examination	1	-	2
4	1 - 4	Value Education	4	8	4
	1 & 2	Ability Enhancement Compulsory Course	2	2	3
	2 - 5	Self - Learning	4	-	8
	3 & 4	Skill Enhancement Course	2	4	2
	5 & 6	Open Elective	2	8	4
5	2 - 6	Outreach Programme (SHEPHERD)	-	-	4
	2 - 6	Co-curricular and Extracurricular Activities	-	-	1
	2 - 6	Extra Credit Courses (MOOC) / Certificate Courses	5	-	(15)
		Total	**61**	**180**	**137 (15)**

B.Sc. BOTANY PROGRAMME PATTERN									
Course Details							Scheme of Exams		
Sem.	Part	Course Code	Course Type	Title of the Course	Hours	Credits	CIA	SE	Final
1	I	25UTA11GL01	GL	General Tamil - 1	4	3	100	100	100
		25UFR11GL01		Language French - 1					
		25UHI11GL01		Language Hindi - 1					
		25USA11GL01		Language Sanskrit - 1					
	II	25UEN12GE01A	GE	**General English – 1:** Pre-Intermediate Stream	5	3	100	100	100
		25UEN12GE01B		**General English – 1:** Intermediate Stream					
	III	25UBO13CC01	CC Major	**Core Course - 1:** Plant Diversity - 1 (Algae and Bryophytes)	5	4	100	100	100
		25UBO13CC02		**Core Course - 2:** Fungi, Lichens and Phytopathology	5	4	100	100	100
		25UBO13CP01		**Core Practical - 1:** Plant Diversity - 1 (Fungi, Lichens and Phytopathology)	3	1	100	100	100
		25UBO13AC01	AC Minor	**Allied Course - 1:** General Zoology - 1: Diversity of Invertebrates and Vertebrates	4	3	100	100	100
		25UBO13AP01		**Allied Practical - 1:** General Zoology - 1: Diversity of Invertebrates and Vertebrates	2	1	100	100	100
	IV	25UHE14VE01	VE	**Value Education – 1:** Essentials of Humanity*	2	1	50	50	50
		25UEN14AE01	AECC	Communicative English	-	2	100	-	100
				Total	**30**	**22**			
2	I	25UTA21GL02	GL	General Tamil - 2	4	3	100	100	100
		25UFR21GL02		Language French – 2					
		25UHI21GL02		Language Hindi - 2					
		25USA21GL02		Language Sanskrit - 2					
	II	25UEN22GE02A	GE	**General English – 2:** Pre-Intermediate Stream	5	3	100	100	100
		25UEN22GE02B		**General English – 2:** Intermediate Stream					
	III	25UBO23CC03	CC Major	**Core Course - 3:** Plant Diversity - 2 (Pteridophytes, Gymnosperms and Palaeobotany)	4	4	100	100	100
		25UBO23CC04		**Core Course - 4:** Anatomy and Embryology	4	3	100	100	100
		25UBO23CP02		**Core Practical - 2:** Plant Diversity – 2: (Anatomy and Embryology)	3	1	100	100	100
		25UBO23AC02	AC Minor	**Allied Course - 2:** General Zoology - 2: Agricultural Entomology	4	3	100	100	100
		25UBO23AP02		**Allied Practical - 2:** General Zoology - 2: Agricultural Entomology	2	1	100	100	100
	IV	25UHE24AE02	AECC	Environmental Studies*	2	1	50	50	50
		25UHE24VE02	VE	**Value Education - 2:** Fundamentals of Human Rights*	2	1	50	50	50
		25UBO24SL01	SL	Online Courses: NPTEL / SWAYAM	-	2	-	100	100
	-	-	-	Extra Credit Course	-	(3)			
				Total	**30**	**22 (3)**			
3	I	25UTA31GL03	GL	General Tamil - 3	4	3	100	100	100
		25UFR31GL03		Language French - 3					
		25UHI31GL03		Language Hindi - 3					
		25USA31GL03		Language Sanskrit - 3					
	II	25UEN32GE03B	GE	General English – 3: English for Science - 1	5	3	100	100	100
	III	25UBO33CC05	CC Major	**Core Course - 5:** Taxonomy of Angiosperms	5	4	100	100	100
		25UBO33CC06		**Core Course - 6:** Advanced Plant Breeding and Evolutionary Adaptations	3	3	100	100	100
		25UBO33CP03		**Core Practical - 3:** Taxonomy of Angiosperms	3	1	100	100	100
		25UBO33AO01A	AO Minor	**Allied Optional - 1:** Chemistry for Biologist - 1	4	3	100	100	100
		25UBO33AO01B		**Allied Optional - 1:** Biometrics and Computer Applications - 1					
		25UBO33OP01		**Allied Optional Practical:** Chemistry for Biologist - 1	2	1	100	100	100
		@		**Allied Optional Practical:** Biometrics and Computer Applications	(2)	-	-	-	-
	IV	25UHE34VE03A	VE	**Value Education – 3:** Social Ethics – 1*	2	1	50	50	50
		25UHE34VE03B		**Value Education – 3:** Religious Doctrine – 1*					
		25UNC34SE01 / 25USS34SE01	SEC	**Skill Enhancement Course – 1:** Introduction to NCC / **Skill Enhancement Course - 1:** Soft Skills	2	1	100	-	100
		25UAI34SL02	SL	Artificial Intelligence (Online)	-	2	100	-	100
	-	-	-	Extra Credit Course	-	(3)			
				Total	**30**	**21/22 (3)**			
4	I	25UTA41GL04B	GL	General Tamil – 4: அறிவியல் தமிழ் (Scientific Tamil)	4	3	100	100	100
		25UFR41GL04		Language French – 4					
		25UHI41GL04		Language Hindi - 4					
		25USA41GL04		Language Sanskrit - 4					
	II	25UEN42GE04B	GE	General English – 4: English for Science - 2	5	3	100	100	100
	III	25UBO43CC07	CC Major	**Core Course - 7:** Cell Biology and Genetics	4	3	100	100	100
		25UBO43CC08		**Core Course - 8:** Phytopharmacy (Internship Embedded Course)	4	4	100	100	100
		25UBO43CP04		**Core Practical - 4:** Cell Biology and Genetics	3	1	100	100	100

		25UBO43AO02A	**AO Minor**	**Allied Optional - 2:** Chemistry for Biologist - 2	4	3	100	100	100
		25UBO43AO02B		**Allied Optional - 2:** Biometrics and Computer Applications - 2					
		25UBO43OP02A		**Allied Optional Practical:** Chemistry for Biologist - 2	2	1	100	100	100
		25UBO43OP02B		**Allied Optional Practical:** Biometrics and Computer Applications	(2)	(2)	100	100	100
	IV	25UHE44VE04A	**VE**	**Value Education – 4:** Social Ethics – 2*	2	1	50	50	50
		25UHE44VE04B		**Value Education – 4:** Religious Doctrine – 2*					
		25UNC44SE02 / 25UBO44SE02	**SEC**	**Skill Enhancement Course – 2:** NCC (Special Subject) / **Skill Enhancement Course – 2:** Mushroom Technology	2	1	100	-	100
		25UBO44SL03	**SL**	**Self - Leaning:** Economic Botany for Sustainable Development	-	2	50	50	50
	-	-	-	Extra Credit Course	-	(3)			
				Total	**30**	**23/22 (3)**			
5	III	25UBO53CC09	**CC Major**	**Core Course - 9:** Biophysics and Biostatistics	6	5	100	100	100
		25UBO53CC10		**Core Course - 10:** Microbiology and Immunology	6	4	100	100	100
		25UBO53CP05		**Core Practical - 5:** Biophysics, Biostatistics, Ecology, Climate Change and Conservation	3	1	100	100	100
		25UBO53CP06		**Core Practical - 6:** Microbiology and Immunology	3	1	100	100	100
		25UBO53ES01A	**DSE**	**Discipline Specific Elective - 1:** Ecology, Climate Change and Conservation	4	3	100	100	100
		25UBO53ES01B		**Discipline Specific Elective - 1:** Bioinformatics and Nanotechnology					
		25UBO53ES02A		**Discipline Specific Elective - 2**: Molecular Biology	4	3	100	100	100
		25UBO53ES02B		**Discipline Specific Elective - 2**: Research Methodology					
		25UBO53IS01	**IS**	Internship	-	1	100	-	100
	IV	25UBO54OE01	**OE**	**Open Elective - 1 (WS):** Aquaculture	4	2	100	100	100
		25UBO54SL04	**SL**	**Certificate Course:** Inland Fisheries	-	2	100	-	100
		-	-	Extra Credit Course	-	(3)			
				Total	**30**	**22 (3)**			
6	III	25UBO63CC11	**CC Major**	**Core Course - 11:** Plant Physiology	6	5	100	100	100
		25UBO63CC12		**Core Course - 12:** Genetic Engineering and Biotechnology	6	4	100	100	100
		25UBO63CP07		**Core Practical - 7:** Plant Physiology	3	1	100	100	100
		25UBO63CP08		**Core Practical - 8:** Genetic Engineering, Biotechnology and Biochemistry	3	1	100	100	100
		25UBO63ES03A	**DSE**	**Discipline Specific Elective - 3:** Biochemistry	4	3	100	100	100
		25UBO63ES03B		**Discipline Specific Elective - 3:** Agricultural Botany					
		25UBO63ES04A		**Discipline Specific Elective - 4:** Bio-entrepreneurship	4	3	100	100	100
		25UBO63ES04B		**Discipline Specific Elective - 4:** Biological Techniques					
		25UBO63EL01A	**EL**	Project / **Industrial Visit** / Field Visit	-	1	100	-	100
		25UBO63EL01B							
		25UBO63EL01C							
		25UBO63CE01	**CE**	Comprehensive Examination*	-	2	50	50	50
	IV	25UBO64OE02	**OE**	**Open Elective - 2:** Landscape Designing and Waste Management	4	2	100	100	100
	-	-	-	Extra Credit Course	-	(3)			
				Total	**30**	**22 (3)**			
	V	25UCW65OR01	**OR**	Outreach Programme	-	4			
		25UCW65EC01	**EC**	Co-curricular and Extracurricular Activities	-	1			
1-6				**Total**	**180**	**137 (15)**			

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

Open Elective - 1 (WS): 5th Semester

School	Course Code	Title of the Course
SBS		
Botany	25UBO54OE01	Aquaculture
Biotechnology	25UBT54OE01	Traditional Medicine and Natural Products

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

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

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

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

அலகு-1 **(12 மணி நேரம்)**

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

அலகு-2 **(12 மணி நேரம்)**

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

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

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

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

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

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

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

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

பாடநூல்:

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

Websites and eLearning Sources:

- *https://www.tamilvu.org/library/nationalized/pdf/35-subbureddiyar/452-panjalisabatham.pdf*
- *https://www.annacentenarylibrary.org - https://shorturl.at/KWZx5*
- *https://eluthu.com/kavithai*
- *https://www.tamilvu.org/courses/degree/p103/p1032/html/p1032614.htm*
- *https://kavithaivaasal.blogspot.com/2017/11/blog-post.html*

Course Outcomes

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

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

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

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

UNIT I **(12 Hours)**

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

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

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

UNIT IV **(12 Hours)**

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

UNIT V **(12 Hours)**

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

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

Book for Study:

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

Books for Reference:

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

Websites and e-learning Sources:

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

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

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

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

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

UNIT I **(12 Hours)**

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

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

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

UNIT IV **(12 Hours)**

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

UNIT V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and e-Learning Sources:

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

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

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

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

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

UNIT I (**12 Hours)**

Introduction to Sanskrit

UNIT II (**12 Hours)**

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

UNIT III (**12 Hours)**

Vartamankala lat lakaara vakya prayogaha

UNIT IV (**12 Hours)**

Samskrita sharala vakya paricayaha

UNIT V (**12 Hours)**

Selected verses from good saying in Sanskrit

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

Books for Study:

Shadhamanjari

Books for Reference:

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

Websites and e-Learning Sources:

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

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

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

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

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

UNIT I: **(15 Hours)**

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

UNIT II: **(15 Hours)**

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

UNIT III: **(15 Hours)**

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

UNIT IV: **(15 Hours)**

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

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

UNIT V: **(15 Hours)**

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

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

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

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

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

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

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

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

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

Unit 2: Family is Forever! (15 Hours)

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

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

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

7. Writing:	**(Skill)**	Describing people (What they wear, how they move and seem to feel, and where they are) Using comma in sentences.
	(Practice)	Controlled composition: Describing people in given pictures

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

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

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

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

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

Books for Study:

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

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

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

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UBO13CC01	**Core Course - 1:** Plant Diversity - 1 (Algae & Bryophytes)	5	4

Course Objectives
Acquire thorough knowledge on the salient features of Algae and Bryophytes.
Learn the major classes, types, structure and reproduction of various genera.
Conserve them in their natural environment.
Acquire the basic knowledge of the evolutionary relationship between algae and bryophytes.
Identify the economic importance of Algae and Bryophytes.

UNIT I **(15 Hours)**

Algae: General characteristics of algae. Commonly found algae in India. Classification (F.E. Fritsch, 1945). Salient features of various classes as per Fritsch's system. Cell structure of prokaryotic algae (Cyanophyceaen cell) and eukaryotic algae (Chlorophycean cell).

UNIT II **(15 Hours)**

Thallus organization, mode of reproduction, algal life cycle patterns (haplontic, diplontic, haplo-diplontic and diplobiontic). Mass culture (Spirulina), economic importance and BGA in *Azolla* as fodder and biofertilizer.

UNIT III **(15 Hours)**

Detailed study of the following genera: occurrence, distribution, common species, structure and reproduction of *Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum* and *Polysiphonia* (excluding developmental studies on sex organs).

UNIT IV **(15 Hours)**

Bryophytes: General characteristics of Bryophytes, Various natural habitats of Bryophytes, Classification (Rothmaler, 1951), vegetative reproduction and economic importance. Evolution of sporophytes among Bryophytes.

UNIT V **(15 Hours)**

Detailed study of the following genera: occurrence, distribution, common species, structure and reproduction of *Marchantia*, *Anthoceros* and *Funaria* (developmental studies on sex organs not required).

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

Books for Study:

1. Pandey, BP. (2018). *College Botany* Volume I, 20/e, S. Chand and Company, New Delhi.
2. Pandey, BP. (2005). *Simplified Course in Botany*. S. Chand and Company, New Delhi.
3. Sharma, OP. (1992). *Text Book of Algae*. Tata McGraw Hill, New Delhi.

Books for Reference:

1. Gangulee, HC. And Kar, AK. (1989). *College Botany*, Vol-II, Books & Allied Pvt. Ltd., Calcutta.
2. Prem Puri. (1981). *Bryophytes- Morphology growth and differentiation*. Atma Ram & Sons. Lucknow.
3. Smith, GM. (1955). *Cryptogamic Botany Vol- 1*& *II*, McGraw Hill, New York.

Website and eLearning Source:

1. https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of Algae/Pereira/p/book/9781498755382
2. https://www.algaebase.org/
3. https://thealgaefoundation.org/academy.html
4. https://microbenotes.com/bryophytes/
5. https://stri.si.edu/story/bryophytes

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Relate to the structural organization, reproduction and significance of algae and bryophytes.	**K1**
CO2	Demonstrate knowledge in understanding the various life cycle patterns and the fundamental concepts in algal growth.	**K2**
CO3	Explain the benefits of various algal technologies on the ecosystem.	**K3**
CO4	Compare and contrast the thallus organization and modes of reproduction in algae and bryophytes.	**K4**
CO5	Determine the emerging areas of Biotechnology for identifying commercial potentials of algal products and their uses.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
1	**25UBO13CC01**			**Core Course - 1:** Plant Diversity - 1 (Algae & Bryophytes)					**5**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	1	3	3	2	2	1	2.1
CO2	1	2	2	2	2	3	2	2	2	1	1.9
CO3	3	3	3	3	3	2	3	3	3	2	2.8
CO4	1	2	3	3	3	1	2	3	3	3	2.4
CO5	3	2	3	3	3	3	2	1	3	3	2.6
Mean Overall Score											**2.36 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UBO13CC02	**Core Course - 2:** Fungi, Lichens and Phytopathology	5	4

Course Objectives
To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of fungi and lichens.
To understand the biodiversity by describing and explaining the morphology of fungi and microorganisms.
To understand the biodiversity by describing and explaining reproductive processes of fungi and microorganisms.
To investigate the classification, distinctive traits, distribution and reproduction and life history of the various classes and major types of fungi and lichens.
Enable to learn various cell structures and functions of prokaryotes and eukaryotes and understand the salient features and functions of cellular organelles.

UNIT I **(15 Hours)**

Fungi: General characteristics. Outline on the Classification of fungi (G. C Ainsworth, 1973; C. J Alexopoulous and C. W. Mims, 1979) and general characteristics of the Divisions and Classes in Fungi. Ecological and Economic importance of Fungi.

Unit II **(15 Hours)**

Fungi: detailed study of morphology and reproduction of the following: (a) Mastigimycotina- *Albugo*; (b) Zygomycotina- *Rhizopus*; (c) Ascomycotina- *Saccharomyces* and *Penicillium*; (d) Basidiomycotina- *Puccinia*; (e) Deuteromycotina- *Cercospora*.

Unit III **(15 Hours)**

Lichens: occurrence, distribution, classification, structure, vegetative and sexual reproduction (with reference to fruticose lichen-*Usnea*). Economic importance and role in succession and pollution monitoring.

Unit IV **(15 Hours)**

Plant Pathology: Definition of terms used in plant pathology; Concepts and classification of plant diseases– methods of control of plant diseases: mechanical, chemical and biological. Defense mechanism in plants: structural, morphological and biochemical.

Unit V **(15 Hours)**

Plant Pathology: Detailed study of the following plant diseases with reference to causes, symptoms, dissemination, control and preventive measures-Viral Diseases: Bunchy top of Banana, mosaic disease of tobacco; Bacterial diseases: Bacterial blight of paddy, Citrus canker, Fungal diseases: Late blight of potato, red rot of sugarcane, paddy blast; Mycoplasma disease: Little leaf of brinjal.

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

Books for Study:

1. Singh V, Pande PC & Jain DK. (2020). *A Text Book of Botany* (5thed), Rastogi Publication, Meerut.
2. Pandey, BP. (2018). *College Botany Volume I*, 20/e, S. Chand and Company, New Delhi.
3. Pandey, BP. (2005). *Simplified Course in Botany*. S. Chand and Company, New Delhi.

Books for Reference:

1. Sharma OP (1989). *Text Book of fungi*. Tata McGraw Hill, New York.
2. Vasishta BR & Sinha AK. (2003). *Botany for degree students Fungi*. S Chand New Delhi.
3. Mehrotra RS (1991). *Plant Pathology*, Tata McGraw-Hill Publishing, New Delhi.
4. Hale ME, (1983) *The Biology of Lichens*, New Age International publishers, New Delhi

Website and eLearning Source:

1. https://www.ffungi.org/en/education
2. https://www.linnean.org/learning/fabulous-fungi
3. https://www.fungiu.com/

4. https://www.fs.usda.gov/wildflowers/beauty/lichens/about.shtml
5. https://www.bspp.org.uk/education/university/
6. https://phytopath.ca/education/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Acquire thorough knowledge on the salient features of fungi and lichens.	**K1**
CO2	Learn the major classes, types, structure and reproduction of various genera.	**K2**
CO3	Attain basic skills on etiology and control of various plant diseases.	**K3**
CO4	Understand the disease cycle caused by the pathogens.	**K4**
CO5	Identify the ecological importance and economic importance of fungi and lichens.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25UBO13CC02**			**Core Course - 2:** Fungi, Lichens and Phytopathology						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	2.4
CO2	2	3	2	1	2	3	1	2	3	3	2.2
CO3	2	2	3	2	1	2	3	2	3	2	2.2
CO4	3	2	2	1	2	3	2	3	2	3	2.4
CO5	2	3	2	3	1	3	2	3	2	1	2.2
Mean Overall Score											**2.3 (medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UBO13CP01	**Core Practical - 1:** Plant Diversity - 1 (Fungi, Lichens and Phytopathology)	3	1

Algae:

External morphology and internal anatomy of the vegetative and reproductive structures of the following life forms

Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum and *Gracilaria.*

Bryophytes:

External morphology and internal anatomy of the vegetative and reproductive structures of the following life forms

*Marchantia, Anthocero s*and *Funaria.*

Fungi:

Plasmodiophora, Albugo, Puccinia, Rhizopus, Aspergillus, Cercospora.

Plant Pathology:

Tobacco Mosaic Virus, Citrus Canker, Late Blight of Potato, Red Rotof Sugarcane, Bunchy Top of Banana, Little Leaf of Brinjal, Paddy Blast

Lichen:

Usnea

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UBO13AC01	**Allied Course - 1:** General Zoology - 1: Diversity of Invertebrates and Vertebrates	4	3

Course Objectives
To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterate, Helminthes and annelida.
To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata.
To comprehend the taxonomic position and diversity among Protochordata, Piscesand Amphibia.
To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia.
To acquire detailed knowledge of select invertebrate and chordate forms.

UNIT-I: Diversity of Invertebrates- I (12 Hours)

Principles of taxonomy, Criteria for classification-Symmetry and Coelom-Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida upto classes with two examples.

UNIT-II: Biodiversity of Invertebrates-II (12 Hours)

Classification of Arthropoda, Mollusca and Echinodermata upto class level with examples

UNIT-III: Biodiversity of Chordates-I (12 Hours)

Classification of Prochordata, Pisces and Amphibia upto orders giving two examples

UNIT-IV: Diversity of Chordates-II (12 Hours)

Classification of Reptilia, Aves and Mammalia upto orders giving two examples

UNIT-V: Animal organisation (12 Hours)

Structure and organization of (i) Earthworm (ii) Rabbit (iii) Prawn

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

Books for Study:

1. Ayyar, M.E. (1972). *Outlines of zoology*. Viswanathan Publication.
2. Rajan K. 2016. *Manual of Zoology, Theory and Practical, Dept of Botany, St. Joseph's College, Tiruchirappalli*

Books for Reference:

1. Ayyar, M.E & Ananthakrishnan, T.N. (1991). A manual of Zoology: Invertebrate (Vol.1). Viswanathan Publishers.
2. Ayyar, M.E & Ananthakrishnan, T.N. (1992). A manual of Zoology: Invertebrate (Vol.2). Viswanathan Publishers.
3. Ayyar, M.E & Ananthakrishnan, T.N. (1981). A manual of Zoology: Chordata. Viswanathan Publishers.
4. Jordan, E. L.&Verma,P.S. (2015). Invertebrate zoology. S. Chand & Co.

Websites and eLearning Sources:

1. https://www.sanctuaryasia.com
2. https://www.iaszoology.com

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recall the characteristic features invertebrates and chordates.	**K1**
CO2	Classify invertebrate's upto class level and chordates upto order level.	**K2**
CO3	Explain and discuss the structural and functional organization of some Invertebrates and chordates.	**K3**
CO4	Relate the adaptations and habits of animals to their habitat.	**K4**
CO5	Analyze the taxonomic position, structure and organization of animals.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25UBO13AC01**			**Allied Course - 1:** General Zoology - 1: Diversity of Invertebrates and Vertebrates						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
Mean Overall Score											**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25UBO13AP01	**Allied Practical - 1:** General Zoology - 1: Diversity of Invertebrates and Vertebrates	2	1

Experiments

1. Earthworm: External features and dissection of digestive and nervous systems.
2. Earthworm-Body setae.
3. Spotters: Study of permanent slides of Invertebrate and Invertebrates: Amoeba, Paramecium, Sea sponge, Corals, *Taeniasolium, Ascarislumbricoides*, Earthworm, Pila, Honeybee, Star Fish, Balanoglossus, Amphioxus, Shark, Frog, Calotes, Pigeon, Rabbit
4. Temporary mounting of Prawn appendages.
5. Study of any two-freshwater plankton.
6. Shark-Placoid Scales
7. Campus fauna identification.
8. Field Visits: Zoological museums.

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

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

UNIT I: Value Education (6 Hours)

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

UNIT II: Human Personality (6 Hours)

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

UNIT III: Human Development (6 Hours)

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

UNIT IV: Responsible Parenthood (6 Hours)

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

UNIT V: Gender Equality and Empowerment (6 Hours)

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

அலகு-1 **(12 மணி நேரம்)**

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

அலகு-2 **(12 மணி நேரம்)**

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

அலகு-3 **(12 மணி நேரம்)**

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

அலகு-4 **(12 மணி நேரம்)**

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

அலகு-5 **(12 மணி நேரம்)**

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

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

பாடநூல்கள்:

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

Websites and eLearning Sources:

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

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

Course Outcomes

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

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

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

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

UNIT I **(12 Hours)**

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

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

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

UNIT IV **(12 Hours)**

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

UNIT V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

UNIT I **(12 Hours)**

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

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

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

UNIT IV **(12 Hours)**

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

UNIT V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and e-Learning Sources:

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

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

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

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

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

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

UNIT I **(12 Hours)**

Asmathi usmath tat kim (MFN) sarva naama sabdaha

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

Lang lakaarah Kriyapadaani Prayoga Vivaranam

UNIT IV **(12 Hours)**

Raguvamsaha Pratama sargaha (1 –15 slokas)

UNIT V **(12 Hours)**

Suvacanani Vakya Prayoga Vivaranam

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

Books for Study:

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

Books for Reference:

1. Paindrapuram Ashram, Srirangam – 620 006 Gopalavimshanthi 2021
2. R.S. Vadhyar & Sons book – Seller and Publishers, Kalpathi, Palghat – 678 003, Kerala, South Inida, shabdha manjari
3. Kulapthy, K.M Saral sankrit Balabodh, Bharathiys Vidya Bhavan, Munshimarg Mumbai – 400 007, 2020

Websites and eLearning Sources:

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

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

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

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

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

UNIT I: **(15 Hours)**

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

UNIT II: **(15 Hours)**

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

UNIT III: **(15 Hours)**

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

UNIT IV: **(15 Hours)**

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

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

UNIT V: **(15 Hours)**

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

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

Books for Study:

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

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

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

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

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

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

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

Unit 2: Travel **15 Hours**

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

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

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

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

Unit 4: Shopping **15 Hours**

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

Unit 5: Ceremonies **15 Hours**

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

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

Books for Study:

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

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

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

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UBO23CC03	**Core Course - 3:** Plant Diversity - 2 (Pteridophytes, Gymnosperms and Palaeobotany)	4	4

Course Objectives
To understand the salient features of pteridophytes and gymnosperms
To trace the evolutionary relationship between pteridophytes and gymnosperms
To study the morphology, anatomy and reproduction of various genera mentioned in the syllabus
To acquire knowledge on fossils and fossilization process
To study the geological time scale along with some fossil representatives

UNIT I **(12 Hours)**

Pteridophytes: General characteristics, classification (Reimer's System, 1954). General characteristics of major subdivisions: Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Stelar evolution. Telome concept and economic importance.

Unit II **(12 Hours)**

Pteridophytes: A detailed study of morphology, anatomy and reproduction of Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea.

Unit III **(12 Hours)**

Gymnosperms: General characteristics. Classification (Sporne, 1965). Distribution in India. Salient features of Pteridospermales, Bennettitales, Cycadales, Cordaitales, Coniferales and Gnetales. Economic importance.

Unit IV **(12 Hours)**

Gymnosperms: Detailed study of morphology, anatomy, reproduction of the following genera: Cycas, Pinus and Gnetum.

Unit V **(12 Hours)**

Paleobotany: Fossils, fossilization process, types (compression, impression, petrifaction, coal balls). Geological time scale. A detailed study of external and internal morphology and reproduction in Rhynia, Lepidodendron, Calamites, and Medullosa.

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

Books for Study:

1. Vasisht a BR, Sinha AK &Anilkumar. (2005). *Botany for degree students: Pteridophytes.* S Chand And Company Ltd., New Delhi.
2. Vasishta PC, Sinha AK &Anilkumar. (2005). *Botany for degree students: Gymnosperms*. S Chand And Company Ltd., New Delhi.

Books for Reference:

1. Rashid. A. (2007). *An Introduction to Pteridophyta* - Vikas publications, New Delhi.
2. Johri, RM, Lata S, Tyagi K (2005), *A text book of Gymnosperms*, Dominate pub and Distributer, New Delhi.
3. Vasista PC, Sinha AK and Anilkimar. 2005. *Botany for degree students, Gymnosperms*, S Chand, New Delhi.

Websites and eLearning Sources:

1. https://bsapubs.onlinelibrary.wiley.com/doi/10.1002/aps3.70003
2. https://pteridophytes.berkeley.edu/
3. https://www.conifers.org/zz/gymnosperms.php
4. https://naturalhistory.si.edu/education/teaching-resources/paleontology
5. https://www.palaeobotany.org/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	To learn the economic importance of Pteridophytes and gymnosperms.	**K1**
CO2	To acquire knowledge on fossils and fossilization process.	**K2**
CO3	To understand the salient features of Pteridophytes and gymnosperms.	**K3**
CO4	To develop critical understanding on morphology, anatomy and reproduction of Pteridophytes.	**K4**
CO5	To develop critical understanding on morphology, anatomy and reproduction of Gymnosperms.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
2	**25UBO23CC03**	**Core Course - 3:** Plant Diversity - 2 (Pteridophytes, Gymnosperms and Palaeobotany)								**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	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	1	2	2	2	3	2	1	2	2.0
CO4	2	3	2	2	1	2	2	2	1	2	1.9
CO5	2	3	1	3	2	2	3	2	2	1	2.1
Mean Overall Score											**2.1 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UBO23CC04	**Core Course - 4:** Anatomy and Embryology	4	3

Course Objectives
To understand various types of tissues present in plants
To acquire knowledge about the tissues of stem, root and leaves
To understand the primary and secondary structure of dicots and monocots with reference to root, stem and leaves
To acquire basic knowledge of the structure and development of male and female gametophytes in plants and dicot and monocot embryos
To study apomixis and polyembryony and their significances.

UNIT I **(12 Hours)**

Tissues-definition, types-simple tissue-parenchyma, collenchyma, sclerenchyma. Fibres and scleriods-structure and functions. Complex tissues: xylem and phloem. Meristems-classifications. Vegetative shoot apex: and the theories: apical cell, histogen and tunica-corpus. Root apex: Korper-Kappe theory. Concept of totipotency, differentiation, dedifferentiation and redifferentiation.

Unit II **(12 Hours)**

The stem-primary and secondary structure of dicotyledonous and monocotyledonous stems. Nodal anatomy: unilacunar, trilacunar and multilacunar. Leaf anatomy: monocot and dicot. The root: primary and secondary structure of dicotyledonous and monocotyledonous roots. Anomalous secondary growth – dicot (*Boerhaavia*) and monocot (*Dracaena*).

Unit III **(12 Hours)**

Wood anatomy-component of secondary xylem. Physical and chemical properties of wood. Classification of wood. Commercial wood species of South India (teak wood, rose wood, sandal wood and red sanders wood).

Unit IV **(12 Hours)**

Microsporangium: microsporogenesis, development of male gametophyte. Megasporangium: megasporogenesis, development of female gametophyte. Monosporic (Polygonum), bisporic (Allium) and tetrasporic (Peperomia).

Unit V **(12 Hours)**

Fertilization. Double fertilization. Development of dicot embryo (Capsella) and development of monocot embryo (Sagittaria). Endosper m function and types. Apomixis and polyembryony-types and significance. Parthenogenesis and its significance.

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

Books for Study:

1. Pandey B.P. (2007) *Plant Anatomy*, S. Chand & Co. De, New Delhi.
2. Bhojwani, S S., Bhatnagar, SP.& Dantu PK. (2015). *The Embryology of Angiosperms*, Vikas Publishing House (P) Ltd., New Delhi.

Books for Reference:

1. Elvira Hörandl et al., (2024). Apomixis in Systematics, Evolution and Phylogenetics of Angiosperms: Current Developments and Prospects, Critical Reviews in Plant Sciences, DOI: 10.1080/07352689.2024.2396259.
2. Ray F. Evert, (2006). Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development" (3rd Edition).
3. Richard Crang, Sheila Lyons-Sobaski, and Robert Wise, (2018). Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants".
4. Lincoln Taiz, Eduardo Zeiger, Ian M. Møller, and Angus Murphy, (2015). Plant Physiology.

Websites and eLearning Sources:

1. https://oercommons.org/browse?f.keyword=plant-anatomy
2. https://vrplants.cals.ncsu.edu/pb250/
3. https://uou.ac.in/sites/default/files/slm/BSCBO-202.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify the simple and complex tissue of plants	**K1**
CO2	Understand the theories and differentiation of cells	**K2**
CO3	Understand the development of embryos	**K3**
CO4	Differentiate the type of ovule and embryo sac	**K4**
CO5	Classify wood into different categories	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25UBO23CC04**			**Core Course - 4:** Anatomy and Embryology						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	2	2	2.3
CO2	2	3	2	3	3	2	3	2	2	2	2.4
CO3	2	2	3	2	3	3	3	2	3	3	2.7
CO4	3	3	2	1	2	3	2	3	1	2	2.3
CO5	2	3	2	2	3	2	3	2	2	3	2.6
Mean Overall Score											**2.5 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UBO23CP02	**Core Practical - 2:** Plant Diversity - 2 (Anatomy and Embryology)	3	1

Detailed study:

1. Pteridophytes: Lycopodium, Selaginella, Adiantum and Marsilea.
2. Gymnosperms: Cycas, Pinus and Gnetum.
3. Fossils: Rhynia, Lepidodendron, Calamites and Medullosa.

Anatomy

4. Study of simple and complex tissue.
5. Internal structure of young and old dicot and monocot stem.
6. Internal structure of dicot and monocot root.
7. Anomalous secondary thickening in Boerhavia and Dracaena.
8. Nodal anatomy: Uni, tri and multi lacunar.

Embryology

9. TS of mature anther.
10. Types of ovule.
11. Dissection and isolation of developmental stages of dicot embryos.

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25UBO23AC02	**Allied Course - 2:** General Zoology - 2: Agricultural Entomology	4	3

Course Objectives
To acquire the knowledge about the classification and morphology of insects.
To understand the functions of internal anatomy of insects.
To aware about the economical importance of selected orders.
To know about the skills involved in entrepreneur development.
To acquire the knowledge about stored and field pest and their control measures.

UNIT I **(12 Hours)**

General classification of insects, Morphology of insects, Mouth parts, compound eye, antennae-thorax-tergum, sternum, pleuron. Wing structure, wing venation and coupling mechanism, Legs and their modification, Abdomen-abdominal appendages, male and female external genitalia.

UNIT II **(12 Hours)**

Physiology of digestive, respiratory, circulatory, nervous and reproductive systems, Immature stages of insects-metamorphosis, types and hormonal regulation

UNIT III **(12 Hours)**

Economically important insect (orders): Coleoptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Orthoptera and Lepidoptera. General characters and classification (up to Orders). Insect as food and medicine

UNIT IV **(12 Hours)**

Economic classification of insects: beneficial insects (predators, parasites, pollinators, weed killers and scavengers). General knowledge of apiculture, sericulture and lacculture. Forensic entomology. Recent trends in Integrated Pest Management. Pest control methods-physical, chemical and biological.

UNIT V **(12 Hours)**

Pests of stored food products (*Sitophilusoryzae*, *Rhizoperthadominica*, *Triboliumcastaneum*) and their control, Pests of Paddy (*Tryporyzaincertulas*, *Chilopolycharysa*), Pest of Sugarcane (*Chiloinfuscatellus*, *Tryporyzanivella*), Pest of Cotton (*Aphis gossypii*, *Amaras cabiguttula*, Pest of Coconut (*Orycytes rhinoceros*, *Rhynchophorus ferrugineus*).

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

Books for Study:

1. Ambrose, P. D. (2004). *The Insect: Structure, function and biodiversity*,(1stEd.).Kalyani Publishers.
2. Vasantharaj, D.B., & Kumaraswami, T. (1978). *Elements of Economic Entomology*. Popular Book Department.
3. Nayar, K.K., Ananthakrishnan, T.N., & David, B.V. (1976). *General and Applied Entomology*, Tata McGraw Hill

Books for Reference:

1. Rajan, K. (2024). *Manual of agricultural entomology-theory and practical*, Department of Botany, St. Joseph's College.
2. Nagarajan, K., Rajan, K., & Palavesam, A. (2017). *A Farmers Hand Book on Pest and Diseases Management in Cardamom (Elettaria cardamomum Maton)*, (1st Ed.). Wise Pub International (P)Ltd., Publishers.
3. Nagarajan, K., & Rajan, K. (2019). *Sericulture Theory and Practice*, (1stEd.). Wise Pub International (P) Ltd., Publishers.

Websites and eLearning Sources:

1. https://agriculture.nmims.edu/agricultural-entomology/
2. https://www.nal.usda.gov/animal-health-and-welfare/beekeeping

3. https://www.gov.nl.ca/ecc/files/env-protection-pesticides-business-manuals-applic-chapter7.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify insect based on morphology.	**K1**
CO2	Identify beneficial and harmful insects.	**K2**
CO3	Understand the physiology of insects.	**K3**
CO4	Apply integrated pest management in field.	**K4**
CO5	Categorize the insects based on its economic importance.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25UBO23AC02**			**Allied Course - 2:** General Zoology - 2: Agricultural Entomology						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	2	2	2	2	2	3	2	**2.2**
CO2	2	3	2	1	2	2	3	2	2	3	**2.2**
CO3	2	2	3	2	1	2	3	2	2	2	**2.1**
CO4	1	2	2	2	2	2	3	2	3	2	**2.1**
CO5	1	2	2	3	2	2	3	2	2	3	**2.2**
										Mean Overall Score	**2.16 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	**25UBO23AP02**	**Allied Practical - 2:** General Zoology - 2: Agricultural Entomology	**2**	**1**

Experiments:

1. Study of insect morphological features (head, thorax, abdomen, mouthparts, wings, legs).
2. Temporary mounting of Mouthparts of cockroach and mosquito.
3. Dissection of Cockroach digestive system and nervous system.
4. Field collection, identification and preservation of insects of agricultural importance, predators, pollinators, and weed killers-plant galls.
5. Preparation and application of biopesticides (e.g., neem extract).
6. Observation of life cycle of *Bombyx mori*.
7. Visit a local sericulture centre and submission of report.
8. **Spotters**: Coleoptera, Orthoptera, Hymenoptera, Diptera, Hemiptera, Lepidoptera, Isoptera. Predatory insect, beneficial insect, parasitic insect, edible insect
9. Insect box Submission

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

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

UNIT I: Introduction to Environmental Studies (6 Hours)

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

UNIT II: Natural Resources (6 Hours)

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

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

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

UNIT IV: Environmental Pollution (6 Hours)

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

UNIT V: Environmental Organizations and Treatise (6 Hours)

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

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

Books for Study:

1. Department of Human Excellence, (2025). *Environmental Studies.*

Books for Reference:

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

Websites and eLearning Sources

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

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

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

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

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

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

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

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

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

UNIT III: India and Human Rights (6 Hours)

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

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

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

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

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

அலகு – 1 : **(12 மணி நேரம்)**

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

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

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

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

அலகு – 2 : **(12 மணி நேரம்)**

சிறுபாணாற்றுப்படை

இலக்கணம் - யாப்பு

அலகு – 3 : **(12 மணி நேரம்)**

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

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

இலக்கிய வரலாறு: சங்க இலக்கியங்கள், சங்க இலக்கியங்களின் தனித்தன்மைகள்

அலகு – 4 : **(12 மணி நேரம்)**

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

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

இலக்கிய வரலாறு: பதினெண்கீழ்க்கணக்கு நூல்கள்

அலகு – 5 : **(12 மணி நேரம்)**

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

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

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

இலக்கணம் - அணி

நாடகம் - விந்தனின் வாழப்பிறந்தவன்

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

பாடநூல்:

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

பார்வை நூல்கள்:

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

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

Websites and eLearning Sources:

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

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

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

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

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

UNIT – I **(12 Hours)**

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

UNIT – II **(12 Hours)**

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

UNIT – III **(12 Hours)**

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

UNIT – IV **(12 Hours)**

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

UNIT – V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

UNIT I **(12 Hours)**

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

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

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

UNIT IV **(12 Hours)**

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

UNIT V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

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

UNIT I **(12 Hours)**

Ramodantam, Balakandam (1-15 verses)

UNIT II **(12 Hours)**

Ramodantam, Balakandam (15-30 verses)

UNIT III **(12 Hours)**

Vedas – Vedangas vivaranam

UNIT IV **(12 Hours)**

Asta dasha Purana and Dashopanishads

UNIT V **(12 Hours)**

Upasargas and Bhavishyat Kaalah Vakya Prayoga

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

Books for Study:

1. VEDIC LITERATURE
2. RAMODANTAM

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

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

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

UNIT II: Life After Death (15 Hours)

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

UNIT III: In Communion with Nature (15 Hours)

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

UNIT IV: Mystery of Venus (15 Hours)

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

UNIT V: Think Before You Trash (15 Hours)

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

* Speaking Components are meant only for internal tests

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

Books for Study:

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

Books for Reference:

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

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

Websites and eLearning Sources:

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

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

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

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UBO33CC05	**Core Course - 5:** Taxonomy of Angiosperms	5	4

Course Objectives
To understand the variations in angiosperms
To understand the basic principles and guiding the plant classifications
To gain knowledge on morphology and nomenclature
To describe and identify plants in technical terms and describing the salient features of different families
To understand the economic and medicinal importance of the various families

UNIT I **(15 Hours)**

History of plant taxonomy. Plant collection, Identification (herbaria and botanical gardens), documentation (keys and flora). Taxonomic hierarchy; Botanical nomenclature: ICN principles, scientific names, ranks, authorship, nomenclatural types, valid publication, rejection of names, priority of publication.

UNIT II **(15 Hours)**

Classification: artificial (Carolus Linnaeus), natural (Bentham & Hooker) and phylogenetic (Engler & Prantle's) and Angiosperm Phylogeny Group (APG). Brief account of cytotaxonomy, chemotaxonomy, molecular taxonomy and numerical taxonomy.

UNIT III **(15 Hours)**

Detailed study and economic importance of the following families (classification based on APG IV, 2016): Basal angiosperms-Nymphaeales: Nymphaeaceae. Mesangiospermae-Magnoliidae-Magnoliales: Annonaceae. Lilidae (Monocots)-Alismatales: Araceae; Asparagales: Orchidaceae; Commelinales: Pontederiaceae; Poales: Poaceae.

UNIT IV **(15 Hours)**

Eudicots-Superrosids-Rosids-Fabids-Fabales: Fabaceae; Rosales: Rosaceae; Cucurbitales: Cucurbitaceae; Malpighiales: Euphorbiaceae, Malvids-Myrtales: Myrtaceae; Sapindales: Anacardiaceae, Rutaceae, Meliaceae.

UNIT V **(15 Hours)**

Eudicots cont.: Superasterids-Caryophyllales: Amaranthaceae; Santalales: Loranthaceae. Asterids-Ericales: Sapotaceae; Gentianales-Rubiaceae, Apocynaceae; Solanales: Solanaceae; Lamiales: Lamiaceae; Asterales: Asteraceae.

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

Books for Study:

1. Michael, G. S. (2019). *Plant Systematics*, (3rd Ed.). Academic Press.
2. Sharma, O. P. (2009). *Plant Taxonomy*. Tata McGraw-Hill Education Pvt. Ltd.

Books for Reference:

1. Sampamurty, A.V.S.S. (2015). *Taxonomy of Angiosperms*, (2nd Ed.). I.K. International Pvt. Ltd.
2. Jeffrey, C. (1982). *An Introduction to Plant Taxonomy*, (2nd Ed.). Cambridge University Press.

Websites and eLearning Sources:

1. https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/ 9781498755382 https://www.bionity.com/en/encyclopedia/History_of_plant_systematics.html
2. https://thegma.org.uk/learning/resources/plant-classification?dt=2019-05-02&sig=wxf3hiQ2qkPhBWa1o4boUHbHvbTDaGxQcxAcegzXMfU%3D
3. https://www.gbif.org/dataset/fa8ab13c-52ed-4754-b838-aeff74c79718

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recognize fundamental plant taxonomy principles and key terms.	**K1**
CO2	Explain plant taxa evolutionary relationships with depth in taxonomy principles and methods.	**K2**
CO3	Apply plant taxonomy knowledge to analyse literature critically and draw conclusions effectively.	**K3**
CO4	Demonstrate proficiency in practical plant taxonomy skills, including fieldwork and specimen curation.	**K4**
CO5	Execute independent plant taxonomy research, showcasing advanced problem-solving abilities	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UBO33CC05**			**Core Course - 5:** Taxonomy of Angiosperms						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	3	2	3	2	2	**2.3**
CO2	3	3	3	2	2	3	2	2	2	3	**2.5**
CO3	3	3	3	2	2	3	3	3	2	2	**2.6**
CO4	2	3	3	2	3	2	3	3	3	3	**2.7**
CO5	3	3	3	2	3	3	3	3	3	3	**2.9**
Mean Overall Score											**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UBO33CC06	**Core Course - 6:** Advanced Plant Breeding and Evolutionary Adaptations	3	3

Course Objectives
To understand the Fundamentals of Plant Breeding and crop improvement.
To develop Skills in Selection and Hybridization Techniques to improve crop traits.
To analyse the Role of Genetic Variation and Evolution in Crop Improvement
To apply Molecular Breeding and genome editing in modern breeding programs.
To evaluate Evolutionary Theories in relation to plant evolution and adaptation and their applications in Biodiversity Conservation

UNIT I: Fundamentals of Plant Breeding (9 Hours)

History and significance of plant breeding in agriculture and food security. Objectives and achievements in plant breeding. Genetic basis of plant breeding and crop improvement. Modes of reproduction in crop plants-Asexual, sexual, and apomictic reproduction (advantages and limitations). Floral biology and its relation to selfing and crossing techniques. Plant Introduction-Types, procedures, and role in biodiversity conservation. Centres of origin and domestication of crop plants-Vavilov's theory and its relevance.

UNIT II: Selection and Hybridization Methods (9 Hours)

Selection Methods-Mass selection, pure-line selection, and clonal selection (merits & demerits). Hybridization Techniques-Objectives, choice of parents, and causes of failure. Incompatibility and male sterility-Methods to overcome reproductive barriers. Handling segregation material-Bulk method and pedigree method. Role of distant hybridization in crop improvement and stress tolerance.

UNIT III: Advanced Breeding Concepts (9 Hours)

Inbreeding depression and heterosis-Genetic basis and applications in hybrid crop development. Steps in hybrid seed production-Single cross, double cross, and three-way cross techniques. Polyploidy and its significance-Induced polyploidy, role of autopolyploids and allopolyploids in crop improvement. Mutation breeding in crop improvement.

UNIT IV: Resistance Breeding and Molecular Approaches (9 Hours)

Backcrossing techniques-Theory and procedures for transferring desirable traits. Breeding for disease resistance and drought tolerance-Rice, sugarcane, groundnut, and maize. Germplasm conservation and utilization. Limitations of conventional breeding-Need for molecular breeding approaches. Introduction to molecular breeding-Use of genetic markers, transgenic crops.

UNIT V: Evolution and Speciation (9 Hours)

Origin of life and theories of evolution-Lamarckism and Darwinism. Types of variations-Definition, causes, and significance in evolution. Mutation and its role in speciation-Hugo De Vries' mutation theory. Evolution through ages-Human evolution and phylogenetic relationships. Evidences for evolution-Fossil records, comparative anatomy, embryology and molecular evidence.

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

Books for Study:

1. Chaudhari, H. K. (1995). Elementary Principles of Plant Breeding, (Revised Ed.). Oxford & IBH.
2. Chittaranjan, K. (2006-07). Genome Mapping and Molecular Breeding in Plants. Vols. I-VII. Springer.
3. Mishra, T (2023). Evolutionary Biology with Practical. Mahaveer publication. ISBN: 978-9394095991.

Books for Reference:

1. Chopra, V. L. (1994). Plant breeding- Theory and Practice. Oxford & IBH.
2. Acquaah, G. (2020). Principles of Plant Genetics and Breeding, (3rd Ed.).
3. Singh, B. D. (2022). Plant Breeding Principles and Methods, (12th Ed.)

Websites and eLearning Sources:

1. https://www.seedworld.com/the-evolution-of-plant-breeding/
2. https://evolution.berkeley.edu/evolution-101/an-introduction-to-evolution/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Explain the principles of plant breeding and genetic improvement in the context of sustainable agriculture and food security.	**K1**
CO2	Perform hybridization and selection techniques to develop high-yielding and stress-resistant crop varieties.	**K2**
CO3	Analyse the genetic basis of heterosis, polyploidy, and mutations and their applications in plant breeding.	**K3**
CO4	Utilize molecular breeding tools and biotechnological approaches for crop improvement and disease resistance.	**K4**
CO5	Interpret evolutionary processes and their impact on plant domestication and biodiversity conservation.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
3	**25UBO33CC06**		**Core Course - 6:** Advanced Plant Breeding and Evolutionary Adaptations						**3**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	**25UBO33CP03**	**Core Practical – 3:** Taxonomy of Angiosperms	**3**	**1**

Detailed Study:

1. Description of plant in technical terms.
2. A detailed study of the range of vegetative and floral characters of plants belonging to the families mentioned in the theory part except Orchidaceae.
3. Field trip to any place within or outside the state to study the plants in their natural habitats.
4. Spot identification (Binomial, Family) of plants included in the theory.
5. Field note-book and 5 herbarium sheets of common angiosperms are to be prepared and submitted at the time of Practical Examination.

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	**25UBO33AO01A**	**Allied Optional - 1:** Chemistry for Biologist - 1	**4**	**3**

Course Objectives
To observe the chemistry of different types of soils and their utility.
To understand the principles involved in periodicity and chemical bonding.
To develop the knowledge the basic concepts of organic chemistry
To relate bioinorganic complex molecules with human life
To apply the various analytical concepts in quantitative analysis.

UNIT I: Periodicity and Chemical Bonding (12 Hours)

Periodicity: classification of elements, division of periodic table into blocks (*s, p, d, f*), atomic radius, ionic radius, ionization energy, electronegativity, electron affinity–trends within a group and periods. General electronic configurations and oxidation states of *s, p* and *d*– block element, inert pair effect.

Ionic Bond – definition, examples, condition for the formation of ionic bond, properties of ionic molecules.

Covalent bond – definition, examples, properties of covalent molecules, hybridization, types of hybridization, VSEPR theory: structures of $BeCl_2$, BF_3, NH_3 and H_2O.

Unit II: Basic Concepts of Organic Chemistry (12 Hours)

Hybridization – sp, sp^2, sp^3 (examples: acetylene, ethylene and methane). Bond length, bond angle, dipole moment, inductive effect, mesomeric effect and hyperconjugation effect. Solubility – protic and aprotic solvents, polarity, dipolemoment.

UNIT III: Quantitative Analysis (12 Hours)

Error Analysis: accuracy, precision, errors, determinate and indeterminate errors, eliminating and minimizing error, relative error, absolute error. Concentration units: mole, molarity, molality, formality, normality, ppm, mole fraction. Primary standard and secondary standard solutions, principle of volumetric analysis, acid–base titration, redox titration, complexometric titration, precipitation titration and indicators.

UNIT IV: Agricultural Chemistry (12 Hours)

Soil types–red soil, black soil, alluvial soil, desert soil, red soil; role of humus: Manures and their importance. Chemical fertilizers: Natural and synthetic fertilizers: NPK fertilizers: manufacture of NPK fertilizers, mixed fertilizers; role of macronutrients and micronutrients: Pesticides: classification insecticides, herbicides and fungicides; Structure of important pesticides: DDT, BHC, 2, 4–D, 2, 4, 5–T; biomass and sits utilization; triple revolution India (Green, Blue and White).

UNIT V: Bioinorganic Chemistry (12 Hours)

Metal ions in biology and their vital role in the active site, structure and functions of metalloproteins and enzymes– ion transport mechanism in cell membrane – Na and K pumps– ionophores – structures and characteristic features of haemoglobin and myoglobin – Vitamin B_{12} – blue copper proteins.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Multiple choice questions, Open book test, assignment, seminar, snap test

Books for Study:

1. Puri, B. R., Sharma, L. R., and Kalia, K. K. (2020). *Principles of Inorganic Chemistry, (*33rd Ed.). Vishal Publishing Co.
   Unit-I: *Chapter 2 and 5*
   Unit-III: *Chapter 40*
   Unit-V: *Chapter 26 and 37*
2. Arun Bahl and Bahl, B. S. (2014). *Advanced Organic Chemistry*, (22nd Ed.). S. Chand.
   Unit-II: *Chapter 4*
3. Sharma, B. K. (2011). *Industrial Chemistry*, Goel Publishing Company.
   Unit-IV: *Chapter 5*

Books for Reference:

1. Puri, B. R., Sharma, L. R., and Pathania, M. S. (1993). *Principles of Physical Chemistry*, (23rd Ed.). ShobanLal Nagin S. Chand.
2. Tewari, K. S., and Vishnoi, N. K. (2000). *A Text Book* of *Organic Chemistry*, (3rd Ed.). S. Chand and Company Pvt. Ltd.
3. Mukherjee, S. M. (2005). *Nomenclature of Organic Chemistry, (*2nd Ed.). Macmillan India Ltd.
4. Sharma, H. D. (2002). *Agricultural Chemistry, (*5th Ed.). Krishna Prakashan Media.

Websites and eLearning Sources:

1. https://bansal.ac.in/acc_sample_ioc.pdf
2. https://www.niser.ac.in/sps/sites/default/files/basic_page/Error%20Analysis_2015.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Observe the chemistry of different types of soils and their utility.	**K1**
CO2	Understand the principles involved in periodicity and chemical bonding.	**K2**
CO3	Develop the knowledge the basic concepts of organic chemistry	**K3**
CO4	Relate bioinorganic complex molecules with human life	**K4**
CO5	Apply the various analytical concepts in quantitative analysis.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UBO33AO01A**			**Allied Optional - 1:** Chemistry for Biologist - 1						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	1	2	3	2	3	1	2	3	2	**2.1**
CO2	3	1	2	2	3	3	2	1	3	2	**2.2**
CO3	2	2	1	3	2	2	1	2	3	2	**2.0**
CO4	3	3	2	1	2	2	2	3	2	1	**2.1**
CO5	3	2	2	3	3	2	3	2	2	3	**2.5**
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UBO33AO01B	**Allied Optional – 1:** Biometrics and Computer Applications - 1	4	3

Course Objectives
To learn the basic concepts of Statistics in biological sciences.
To solve the systems of linear equations and its applications.
To Impart the knowledge of mathematical modeling.
To understand the important concepts of statistical data.
To know the various statistical measures.

Unit I **(12 Hours)**

Types of measurements – Interval, ratio, rank order and categorical - Logarithm, Permutation and Combination

Unit II **(12 Hours)**

Solving Equations: Solving simple linear equation involving one variable and two variables. Matrices - Operation on matrices – Determinants – Inverse – Solving a system of equations of order 3x3 using Cramer's rule and inverse method.

Unit III **(12 Hours)**

Mathematical modeling: Principle of least squares (concepts only) – Curvilinear regression, $y = ax^2 + bx + y = ax^2 + bx +$c, $y = ab^x y = ab^x$ and $y = ae^{bx} y = ae^{bx}$.

Unit IV (**12 Hours)**

Statistics –Introduction -Uses and limitations of Statistics – Collection and classification of data - Frequency table – Frequency graphs – Diagrammatic representation of data -Sampling-Census and sample method - Methods of sampling.

Unit V **(12 Hours)**

Measures of location: Mean, Median and Mode. **Measures of Dispersion**: Range, Mean deviation, Standard deviation and Coefficient of variation. Skewness and Kurtosis. Measures of Location, Measures of Dispersion, Skewness and Kurtosis in IKS

Teaching Methods	YouTube videos, PPT, Black Board teaching and Handouts.
Assessment Methods	

Books for Study:

1. Gupta S.P, (2014). *Statistical Methods*. (43rd Ed) Sultan Chand & Sons, New Delhi.
2. PA. Navanitham, (2015). *Business Mathematics and Statistics*, Jai publishers.
3. Gupta S.P. &Kapoor V.K., (2020). *Fundamentals of Mathematical Statistics*. (12th Ed) Sultan Chand & Sons, New Delhi.

Books for Reference:

1. NageswaraRao G. (2018). *Statistics for Agricultural Science.* (3rd Ed) BS Publications.
2. Olive Jean Dunn & Virginia A Clark (2009). *Basic Statistics: A primer for the Biomedical Sciences*. (4th Ed). A John Wiley & Sons, Inc., Publications.

Website and eLearning Resources:

1. https://youtu.be/W7sMRIOL7LM
2. https://youtu.be/CcFXaFBl1kA
3. https://youtu.be/AAuuh-72HxYhttps://youtu.be/NOUs-JTDnH8

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Acquire the knowledge of Statistics in biological context.	**K1**
CO2	Describe the concept of measurement, solving equations, mathematical modeling, Statistics measures.	**K2**
CO3	Compute the statistical constants.	**K3**
CO4	Apply the statistical concepts in real life problems.	**K4**
CO5	Analyse the univariateand bivariate data.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**				**Hours/Week**		**Credits**	
3	**25UBO33AO01B**			**Allied Optional – 1:** Biometrics and Computer Applications - 1				**4**		**3**	
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	2	2	1	3	2	2	3	1	3	2.2
CO-2	1	2	3	2	3	1	3	2	3	3	2.3
CO-3	3	2	2	3	2	1	3	3	2	2	2.3
CO-4	2	3	2	2	1	3	2	2	3	3	2.3
CO-5	3	3	3	1	3	2	2	1	3	3	2.4
									Mean Overall Score		**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25UBO33OP01	**Allied Optional Practical - 1:** Chemistry for Biologist - 1	2	1

Course Objectives
To learn the concept of concentration of solutions
To learn the methods of preparing solutions and carrying out titrations
To understand the principles of titrimetric analysis
To understand the principles of quantitative analysis
To learn the principles of complexometric titrations

UNIT I: Principles of Quantitative Analysis (6 Hours)

Introduction – types of quantitative analyses – theory of significant figures– error analysis – apparatus used in titrimetric analysis – handling of digital balances and other apparatus – concept of molecular weight, formula weight, equivalent weight – concentrations of solutions – molarity, formality, normality, weight percentage.

UNIT II: Principles of Titrimetry (6 Hours)

Principle of titrimetry – primary and secondary standards – preparing standard solutions – standardizing the secondary standard solutions –types of titrimetric analyses – principal reactions – concepts of acids, bases, oxidants and reductants – theory of indicators – calculations for strengths of solutions and the amount of substances in solution.

UNIT III: Preparation of Solutions and Types of Titrimetric Methods (6 Hours)

1. Preparation of a standard solution.
2. Preparing a standard solution and doing a titration.
3. Making up a given solution and doing a titration.
4. Estimation of strength of a solution.
5. Types of titrimetric methods and indicators used.

UNIT IV: Volumetric Analysis-I (6 Hours)

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of NaOH by HCl using a standard sodium carbonate solution.
3. Estimation of oxalic acid by $KMnO_4$ using a standard FAS solution.
4. Estimation of FAS by $KMnO_4$ using a standard oxalic acid solution.
5. Estimation of $KMnO_4$ by FAS using a standard $K_2Cr_2O_7$ solution.
6. Estimation of $FeSO_4$ by $KMnO_4$ using a standard Ferrous sulphate solution.

UNIT V: Volumetric Analysis-II (6 Hours)

1. Estimation of $K_2Cr_2O_7$ using sodium thiosulphate solution.
2. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3solution.
3. Estimation of zinc (EDTA titration).
4. Estimation of magnesium (EDTA titration).
5. Estimation of hardness of water (EDTA titration).

Teaching Methodology	Laboratory Demonstration
Assessment Methods	Test, viva voce

Books for Study:

1. Coulling, A. (2013). *A Complete Guide To Volumetric Analysis* (1st Ed.). CreateSpace Independent Publishing Platform.
2. Department of Chemistry, St. Joseph's College. (2021). *Allied Practical Manual* (Private circulation).
3. Puri, B. R., Sharma, L. R., & Kalia, K. K. (1993). *Principles Of Inorganic Chemistry* (23rd Ed.). Shoban Lal Nagin Chand and Co.
4. Schimpt, H. W. (2019). *Essentials Of Volumetric Analysis* (1st Ed.). Wentworth Press.

Books for Reference:

1. Furniss, B. S. (1984). *Vogel's Textbook of Practical Chemistry* (7th Ed.). ELBS.
2. McPherson, P. (2014). *Volumetric Analysis* (1st Ed.). Royal Society of Chemistry.
3. Venkateswaran, V., Veeraswamy, R., &Kulandaivelu, A. R. (1997). *Basic Principles Of Practical Chemistry* (2nd Ed.). Sultan Chand and Sons.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=FUo428guKt0
2. https://www.youtube.com/watch?v=_G6_OEa1BjA
3. https://youtu.be/wRAo-M8xBHM
4. https://www.britannica.com/science/volumetric–analysis
5. https://www.youtube.com/watch?v=loxMW2honqw



Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
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 volumetric analysis.	**K3**
CO4	Detect the range of pH at which complexation takes place.	**K4**
CO5	Demonstrate various techniques of volumetric analysis.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25UBO33OP01**			**Allied Optional Practical - 1:** Chemistry for Biologist - 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	2	3	2	3	2	2	3	2	2	3	**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
3	25UHE34VE03A	**Value Education - 3:** Social Ethics - 1	2	1

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

UNIT I: Introduction to Social Ethics (6 Hours)

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

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

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

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

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

UNIT IV: Cyber Crime (6 Hours)

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

UNIT V: Social Integration (6 Hours)

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

UNIT I **(6 Hours)**

God of salvation

UNIT II **(6 Hours)**

Life & Mission of Jesus Christ

UNIT III **(6 Hours)**

The Holy Spirit

UNIT IV **(6 Hours)**

Gospel Values

UNIT V **(6 Hours)**

Mary, the mother of God

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

Books for Study:

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

Books for Reference:

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

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

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

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

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

UNIT I Communication Skills (6 Hours)

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

UNIT II Resume Writing & Interview Skills (6 Hours)

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

UNIT III Personal Effectiveness (6 Hours)

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

UNIT IV Numerical Ability (6 Hours)

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

UNIT V (6 Hours)

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

அலகு - 1 **(12 மணி நேரம்)**

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

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

உரைநடைக்கட்டுரை: வியக்க வைக்கும் தமிழரின் அறிவியல்

பயன்முறை கற்றல்: வலைப்பூக்கள் உருவாக்கம்- அறிவியல்கலைச்சொல்லாக்கம்

அலகு - 2 **(12 மணி நேரம்)**

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

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

உரைநடைக்கட்டுரை: தமிழர்களின் மருத்துவ அறிவியல்

புதினம்: இரா.நடராசன் : சர்க்கஸ்.காம்

அலகு - 3 **(12 மணி நேரம்)**

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

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

உரைநடைக்கட்டுரை: தமிழ் இலக்கியங்களில் வெளிப்படும் நீர் மேலாண்மையியல்

பயன்முறை கற்றல்: நூல் – திறனாய்வு

அலகு - 4 **(12 மணி நேரம்)**

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

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

உரைநடைக்கட்டுரை: தமிழில் அறிவியல் புனைவுகள்

பயன்முறை கற்றல்: திரைப்படத் திறனாய்வு- ஆவணப் படத்திறனாய்வு

அலகு - 5 **(12 மணி நேரம்)**

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

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

உரைநடைக்கட்டுரை: அறிவியல் தமிழின் வளர்ச்சி நிலைகள்;

பயன்முறை கற்றல்: பழமொழிகளில் அறிவியல், மூலிகைகளைக் கண்டறிதல்

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

பாட நூல்கள்:

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

பார்வை நூல்கள்:

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

Websites and eLearning Sources:

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

Course Outcomes

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

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

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

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

UNIT – I **(12 Hours)**

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

UNIT – II **(12 Hours)**

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

UNIT – III **(12 Hours)**

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

UNIT – IV **(12 Hours)**

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

UNIT – V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

UNIT I **(12 Hours)**

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

UNIT II **(12 Hours)**

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

UNIT III **(12 Hours)**

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

UNIT IV **(12 Hours)**

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

UNIT V **(12 Hours)**

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

UNIT I **(12 Hours)**

Samskrita Vyavahara sahasri vakiya Prayogaha

UNIT II **(12 Hours)**

Lot Lakaarah, Prayaogh Kartari Vaakyaani

UNIT III **(12 Hours)**

Naatakasya Itihaasah Vivaranam, Thuva and Tum Suffixs

UNIT IV **(12 Hours)**

Karnabhaaram, Naatakasya Visistyam

UNIT V **(12 Hours)**

Samskrita Racanani Vubhavoga

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

Books for Study:

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

Books for Reference:

1. R. S. Vadhyar & Sons, Book – sellers and publishers, Kalpathu, Palghat – 678 003, Kerala, south India, History of Sanskrit Literature 2021
2. Kulapathy, K.M Saral Sanskrit Balabodh, Bharathita vidya bhavan, Munshimarg Mumbai – 400 007 2020
3. Samskrita Bharathi, Aksharam 8 th cross, 2nd phase Giri nagar Bangalore Vadatu sanskritam – Samaskara Binduhu 2021

Websites and eLearning Sources:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

* Speaking Components are meant only for internal tests

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO43CC07	**Core Course - 7:** Cell Biology and Genetics	4	3

Course Objectives
To understand the organization of cells.
To acquire knowledge on the structure and organization of various cell organelles
To learn cell cycle and methods of cell division
To solve problems with relevance to the principles and applications of genetics.
To acquire basic knowledge on genomics and proteomics.

UNIT-I **(12 Hours)**

Cell: prokaryotic and eukaryotic; cell theory. Structure and functions of nucleus, mitochondrion, chloroplast, nitroplast, endoplasmic reticulum, Ribosome, Golgi complex, lysosome and vacuole. Organisation of cytoskeleton.

UNIT-II **(12 Hours)**

Cytoplasmic membrane; structure and functions. Cell division (mitosis and meiosis), Cell cycle. Mutation-types, causes and detection. Mutant types-lethal, conditional, biochemical; germinal vs somatic mutants, insertional mutagenesis. Special types of chromosome-polytene and lampbrush.

UNIT-III **(12 Hours)**

Mendel'slaws of heredity, Modified Mendelianratios. Multiple alleles. Linkage and crossing over. Sex linked inheritance. Sex determination mechanism. Extra chromosomal inheritance.

UNIT-IV **(12 Hours)**

DNA is the genetic material: Griffith's, Avery et al., and Hershy and Chase. RNA as genetic material. Basic knowledge and applications of genomics and proteomics. Genomics: structural and functional genomics. Plant genome (*Arabidopsis* and *Oryza*), animal (*Homo sapiens*). Human Genome Project-objectives and controversies.

UNIT-V **(12 Hours)**

Population genetics: gene frequency, genepool, Hardy-Weinberg equilibrium. Genetic drift, Gene frequencies-conservation and changes. Eugenics. Selection-natural, artificial, ecological.

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

Books for Study:

1. Verma, P. S., & Agarwal, V. K. (2003). *Genetics*. S. Chand & Co.Ltd.
2. Gupta, P. K. (2018). *Genetics*, (5thEd.). Rastogi Publications.

Books for Reference:

1. Sinnott, E. W., Dunn, L. L., & Dobzhansky, T. (1997). *Principles of Genetics*. Tata MaGrawHill.
2. Freifelder, D. (1993). *Essentials of Molecular Biology*. Jones & Bartlett, Boston.
3. Gardner, E. J., Simmons, M. J. & Snustad, D. (1991). *Principles of Genetics*, (8thEd.). John Wiley & Sons.

Websites and eLearning Sources:

1. https://www.sciencelearn.org.nz/resources/1989-cell-biology-and-genetics
2. https://www.wiley.com/en-us/etextbooks-and-courseware/biology/cell-biology-and-genetics

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recall the evolution, diversity and replication of cells.	**K1**
CO2	Understand the role of compartmentalization and signaling in cellular biology	**K2**
CO3	Interpret and explain key experiments in the history of cell biology.	**K3**
CO4	Apply knowledge of modern techniques in cellular biology.	**K4**
CO5	Describe genes structure, chromosomes and proteins.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UBO43CC07**			**Core Course - 7:** Cell Biology and Genetics						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	2	2	**2.3**
CO2	2	3	2	3	3	2	3	2	2	2	**2.4**
CO3	2	2	3	2	3	3	3	2	3	3	**2.7**
CO4	3	3	2	1	2	3	2	3	1	2	**2.3**
CO5	2	3	2	2	3	2	3	2	2	3	**2.6**
Mean Overall Score											**2.5 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO43CC08	**Core Course - 8:** Phytopharmacy (Internship Embedded Course)	4	4

Course Objectives
To evaluate the medicinal plants based drug efficacy and its various applications.
To create new drug formulations using phytochemical compounds for the healthy life of society.
To apply the knowledge to cultivate and market medical plants.
To know the pharmacological importance of medicinal plants.
To enlist phytochemicals and secondary metabolites commercial value.

UNIT-I **(12 Hours)**

Introduction and Scope of Phyto-pharmacy. Adulteration and methods to encounter adulteration of plant drugs. Evaluation of plant drugs-Organoleptic evaluation of drugs: including gross morphology, sampling, preliminary examination and foreign matter. Physical evaluation of plant drugs: Determination of moisture content, foreign organic matter, ash values, extractive values and swelling index.

UNIT-II **(12 Hours)**

Selection, identification and authentication of herbal materials, drying and processing of herbal raw material Cultivation technology, post harvest care and processing of medicinal and aromatic plants: Profile of some high trade value plants: Chirata, Giloe, Gudmar, Isapgol, Jatamansi, Kalmegh, Kesar, Mulethi, Sarpagandha and Tulsi, Ashwagandha, Belladona, Ginger, Turmeric, Aloes, Digitalis, Vinca, Ephedra, Senna, etc

UNIT-III **(12 Hours)**

Extraction of Herbal Materials, Different methods of extraction conventional (soxhlet, reflux, decoction, percolation, infusion), and novel/green methods (microwave assisted, ultrasonic assisted, supercritical fluid extraction, pressurized extraction. Herbs as raw materials: Definition of herb, source of herbs, herbal medicine, herbal medicinal product, herbal drug preparation. Phytochemical evaluation of plant drugs: Qualitative and Quantitative evaluation of phytoconstituents such as Alkaloids, steroids, terpenoids, flavonoids, glycosides, tannins etc.

UNIT-IV **(12 Hours)**

Isolation of phytoconstituents: General methods of isolation and separation of phytoconstituents. chemical properties, characterization (excluding synthesis) and therapeutic uses of some medicinally important class of Plant Phenolics (Tannins & flavonoids), Alkaloids (Quinine, Vincristine, Vinblastine), Glycosides (Sennoside, Digoxin), Terpenoides, Volatile oils. Ethnoplants, plants used in folklore and tribal medicines. WHO Guidelines for cultivation, collection and quality control of Herbal Drugs.

UNIT-V **(12 Hours)**

Phyto-remedies - Toxicity & Regulations: Importance of Herbal Therapies, Herbal versus Conventional drugs, Efficacy of herbal therapies, safety in herbal drugs, toxicity in Herbals. Nutraceuticals and herbal health supplements. Herbal drug regulations in India. Application of computers in Phytopharmacy: Smart search using internet, use of AI based search engines and web sites, drug information sources. Introduction to computer-aided drug design (CADD), QSAR various software's and molecular modeling in CADD. Importance of docking studies in drug development.

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

Books for Study:

1. Evans, 2009. Pharmacognosy, Elsevier Publications, Edinburgh.
2. James Green, 2000 Herbal Medicine-Maker's Handbook, Crossing Press, U.S.
3. H.E. Street, 1997. "Plant Cell and Tissue Culture". Blackwell Scientific, London.

Books for Reference:

1. Weiss, Rudolf Fritz 2000 Herbal Medicine, 2ndEditionThieme Medical Publishers
2. C.K. Atal, "Cultivation and Utilization of Medicinal plants". R.R.L. Jammu

3. Kokate CK, Purokit A Pand Gokahale, 2006. Pharmacognosy, Nirali Prakashan.
4. Somasundara, S1997. Maruththuva Thavaraiyal, Ilangovan Padhippagam, Palayamkottai
5. Quality control and evaluation of Herbal Drugs b yPulok. K. Mukarjee (2019)

Websites and eLearning Sources:

1. http://www.gallowglass.org/jadwiga/herbs/preparations.html
2. http://shawnacohen.tripod.com/thetribaltraditions/id51.htmlhttp://www.v asundharaorissa.org/Research%20Reports/Globalisation
3. http://www.emea.europa.eu/docs/en_GB/document_library/Scien tific_ guideline/2009/09/WC500003393.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understanding about standard quality control parameters to test quality of crude drugs from natural origin.	**K1**
CO2	Gain the knowledge about an effective extraction and isolation methods Phytochemicals.	**K2**
CO3	Learn the identification of Phytopharmacy based high trade value plants and processing of medicinal & Aromatic plants.	**K3**
CO4	Analyze the suitable conservation method for medicinal plants using modern biotechnology tools to ensure the sustainable utilization.	**K4**
CO5	Evaluate the herbal drugs efficacy for different ailments and application computers in Phytoparmacy.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
4	**25UBO43CC08**	**Core Course - 8:** Phytopharmacy (Internship Embedded Course)								**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	1	3	3	3	1	2	2	2.3
CO2	2	2	3	1	2	1	3	3	2	3	2.2
CO3	3	3	3	2	3	2	3	3	2	3	2.7
CO4	3	1	3	2	3	2	3	1	2	2	2.2
CO5	2	3	2	2	3	1	1	2	3	2	2.1
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	**25UBO43CP04**	**Core Practical - 4:** Cell Biology and Genetics	**3**	**1**

1. Ultrastructure of cell organelles.
2. Study of mitosis in root tips
3. Study of meiosis in anthers
4. Inheritance Patterns-Mendelian and modified Mendelianratios
5. Linkage Mapping.
6. Estimation of allele frequency in natural (random matting) populations.
7. Isolation and display of polytene chromosomes.
8. Extraction of human genomic DNA from saliva.
9. Estimation of DNA (Colorimetric).
10. Primary level of Phytochemical studies
11. Techniques and instrumentation of thin layer chromatography (TLC)
12. Submission of Herbal drug raw materials
13. Preparation of plant based foods, Edible dyes, sweeteners, perfumery and cosmetic agents.

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO43AO02A	**Allied Optional - 2:** Chemistry for Biologist - 2	4	3

Course Objectives
To recognize the chemistry of natural products.
To discuss the fundamental aspects of pharmaceutical chemistry.
To understand the extraction of metals and preparation, properties of compounds of non metals.
To apply the chromatographic techniques to analyze and to identify the components.
To classify the types of catalyst and their effects on the reactions

Unit I: Carbohydrates (12 Hours)

Introduction – classification – nomenclature – physical properties – glucose – cyclic structures – chemical properties – mutarotation – anomerism – epimerization – fructose – cyclic structures – disaccharides: lactose, maltose, cellobiose and sucrose (structures only) – structural differences between starch and cellulose –uses of cellulose and its derivatives.

UNIT II: Pharmaceutical Chemistry (12 Hours)

Classification of drugs: Definitions of: drug, pharmacophore, pharmacognory, pharmacy, pharmaco kinetics, pharmaco dynamics, pharmacopoeia (IP, BP, USP). Antibiotics: Penicillin, chloramphenicol, (only the structural properties and SAR): Anaesthetics–general and local anaesthetics: Inhalation anaesthetics (N_2O, $CHCl_3$, haloethane, ethylchloride). Intravenous anaesthetics (thiopental sodium); Cardiovascular Drugs: classification and examples: cardiac glycosides, antihypertensive and anti–hypotensive drugs and sulphonamides –isolation of bioactive molecules from plants by soxhlet method.

UNIT III: Chemistry of Natural Products (12 Hours)

Vitamins–type, sources and deficiency disorders of Vitamins A_1 retinol, Vitamin B complex (thiamine–B_1, riboflavin–B_2, cyclocobalamine–B_{12}), Vitamin C, Vitamin D and Vitamin E. Alkaloids: Occurrence, classification, physical properties, biological functions and uses of alkaloids. Classification, isolation, structure, properties and uses of terpenoids.

UNIT IV: Catalysis (12 Hours)

Types of catalyst–positive catalyst, negative catalyst and catalyst poison. types of catalysis– homogeneous catalysis, heterogeneous catalysis and autocatalysis – general characteristics of catalytic reactions, autocatalysis**.** Biocatalysis– enzyme catalyst, kinetics of enzyme catalysis, Michaelis – Menton constant, active sites, turn over number, factors affecting enzyme catalysis; concentration of substrate, temperature, pH and inhibitors.

UNIT V: Separation and purification techniques (12 Hours)

Types of Chromatographic Techniques– TLC – Column – HPLC: Principles, instrumentation, sampling and applications of paper, thin layer, column chromatography and electrophoresis–distillation – steam and vacuum distillation – recrystallization.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	MCQ, Open book test, assignment, seminar, snap test

Books for Study:

1. Morrison, R. T., and Boyd, R. N. (2011). *Organic Chemistry*, (7th Ed.). Allyn and Bacon Ltd.
   Unit - I *Chapter 34 and 35*
2. Ghosh, J. (2012). *A Text Book of Pharmaceutical Chemistry*, (3rd Ed.). S. Chand and company Pvt. Ltd.
   Unit- II *Chapter 11*
3. Finar I L, (1996). *Organic Chemistry*, Vol: 1 and 2, (6th Ed.). Addison Wesley Longman Ltd. England,
   Unit - III *vol. 2 Chapter 8 and 11* **Unit III***vol. 1 Chapter 14*
4. 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 31*

5. Subramanian, P. S., Gopalan, R., & Rangarajan, K. (2003). *Elements of Analytical Chemistry*. S. Chand.
   Unit - V *Chapter 9*

Books for Reference:

1. Tewari, K. S., and Vishnoi, N. K. (2000). *A Text Book* of *Organic Chemistry*, (3rd Ed.). S. Chand and Company Pvt. Ltd.
2. Arun Bahl and Bahl, B. S. (2014). *Advanced Organic Chemistry*, (22nd Ed.). S. Chand.
3. Acheson, R. M. (1993). *Chemistry of Natural Products, (*1st Ed.). Macmillan.
4. Smith, D. J. W. (2002). *Pharmaceutical Chemistry, (*4th Ed.). Churchill Livingstone.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=bYwq5oNZmq4
2. https://www.slideshare.net/Kamyaparashar/chemical–kinetics–presentation

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recognize the chemistry of natural products.	**K1**
CO2	Discuss the fundamental aspects of pharmaceutical chemistry.	**K2**
CO3	Understand the extraction of metals and preparation, properties of compounds of non metals.	**K3**
CO4	Apply the different types of chromatographic techniques to analyze and to identify the components.	**K4**
CO5	Classify the types of catalyst and their effects on the reactions	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UBO43AO02A**			**Allied Optional - 2:** Chemistry for Biologist - 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	3	3	2	3	2	2	3	**2.5**
CO2	2	2	1	3	2	2	1	2	3	2	**2.0**
CO3	3	1	2	2	3	3	2	1	3	2	**2.2**
CO4	3	3	2	1	2	2	2	3	2	1	**2.1**
CO5	2	1	2	3	2	3	1	2	3	2	**2.1**
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO43AO02B	**Allied Optional - 2:** Biometrics and Computer Applications - 2	4	3

Course Objectives
To Impart the knowledge of normal distributions.
To Understand the statistical hypothesis.
To Learn the basic concepts of correlation and regression.
To Learn the concepts of theory of attributes.
To Understand the non-parametric test.

Unit I **(12 Hours)**

Probability: Normal distribution – Definition – Properties – Areas under normal curve – Interpreting areas as probabilities – Importance of normal distributions. Confidence interval: Confidence interval for means – between two means, variance and proportion.

Unit II **(12 Hours)**

Testing of hypothesis: Null hypothesis – Two kinds of errors – Testing of hypothesis based on simple mean – difference between mean – Population proportion – Difference between the population proportion – Chi-square test – Goodness of fit – Test for independence – F- test: Equality of variances. Testing of Hypothesis in IKS

Unit III **(12 Hours)**

Correlation and regression: Correlation: Types of correlation – Scatter diagram – Pearson's coefficient of correlation – Rank correlation. Simple regression: Meaning of regression lines –Regression equations y on x and x on y only – Regression coefficient – Simple problems.

Unit IV **(12 Hours)**

Theory of attributes: Introduction – Notations – Dichotomy – Classes and class frequencies – Consistency of data – Criteria of independence – Yule's coefficient of association – Coefficient of colligation.

Unit V **(12 Hours)**

Non –Parametric tests: Introduction –Advantages - Sign test-Mann Whitney U test – One sample runs test –Kruskal – Wallis test and Run test for randomness.

Teaching Methodology	Chalk and Talk, PPT, You Tube video and Handouts.
Assessment Methods	Seminar, Problem solving Assignment, Online test.

Books for Study:

1. Gupta S.P, (2014). *Statistical Methods*, (43rd Ed) Sultan Chand & Sons, New Delhi,

Books for Reference:

1. NageswaraRao G (2018). *Statistics for Agricultural Science*, (3rd Ed) BS Publications,
2. Olive Jean Dunn& Virginia A Clark (2009). *Basic Statistics*: A primer for the Biomedical Sciences, A John Wiley & Sons, Inc., Publications, Fourth Edition.

Website and eLearning Resources:

1. https://youtu.be/TvkdX6Dw994
2. https://youtu.be/MHrDKdk9hw0 , https://youtu.be/NOUs-JTDnH8

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Knowledge about formulating and testing a hypothesis and determining probability of making errors in hypothesis tests.	**K1**
CO2	Understand the concept of test of significance.	**K2**
CO3	Explain the concept of normal distribution, statistical hypothesis, correlation, regression, association of attributes and non-parametric test.	**K3**
CO4	Apply hypothesis testing techniques to real-world scenarios.	**K4**
CO5	Give the statistical interpretation about parametric and non-parametric test.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours/Week**		**Credits**
4	**25UBO43AO02B**			**Allied Optional - 2:** Biometrics and Computer Applications - 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	3	3	1	2	3	2	2.3
CO2	3	2	2	3	3	3	2	1	2	3	2.4
CO3	2	3	2	2	2	3	2	2	2	3	2.3
CO4	3	3	2	2	3	2	1	3	3	2	2.4
CO5	3	2	3	1	2	3	3	2	2	3	2.4
Mean Overall Score											**2.36 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO43OP02A	**Allied Optional Practical:** Chemistry for Biologist - 2	2	1

Course Objectives
To learn the safety in the lab
To understand the chemical nature of organic compounds
To understand the principles of organic qualitative analysis
To learn the element analysis
To learn the tests for confirming the presence of functional groups

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

Introduction - personal protection - nature of chemicals - toxic, corrosive, explosive, inflammable, Carcinogenic and other hazardous chemicals - philosophy of lab safety - first-aid techniques -General work culture inside the chemistry lab - handling of chemicals and apparatus in the laboratory - storage and handling of chemicals - disposal of chemical wastes - glassware - handling of glassware – handling of different types of laboratory equipment like Bunsen burner – centrifuging apparatus –Kipp's apparatus.

UNIT II: Introduction to Aromatic and aliphatic compounds (6 Hours)

Flame test and nitration test for the presence of Aromatic compounds – explosive nature of sodium metal in water – reason for kept in kerosene – Saturated and unsaturated organic compounds – reaction with bromine water and potassium permanganate – reason for decolorization - nitrogen, Sulphur and halogen compounds - Ferrous sulphate test for nitrogen – sodium nitroprusside test for Sulphur – silver nitrate test for halogens - Functional group tests- tests for carbohydrates – tests for phenols – tests for amines – tests for carboxylic acids –tests for nitrobenzene.

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

Qualitative analysis of organic substances - solubility test in $NaHCO_3$, NaOH and HCl – acidic, basic and neutral nature of organic compounds - test for saturation and unsaturation - aliphatic and aromatic nature of organic compounds - preparation of Lassaign's sodium fusion extract - element tests for N, S and halogens.

UNIT IV: Analysis of Organic Compounds (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.

UNIT V: Functional Group Analysis (6 Hours)

1. Test for Monocarboxylic & Dicarboxylic acids
2. Test for Monohydric & Dihydric phenols
3. Test for amine
4. Test for Carbohydrates
5. Test for Ginger Extracts – Demo only
6. Test for Alkaloids – Demo only

Teaching Methodology	Laboratory demonstration, chalk and talk
Assessment Methods	Viva voce, and Snap Test

Books for Study:

1. Gnanapragasam, N. S., & Ramamurthy, G. (2007). *Organic Chemistry Lab Manual* (2nd Ed.). S. Viswanathan Printers and Publishers (P) Ltd.
2. Department of Chemistry, St. Joseph's College. (n.d.). *Allied Practical Manual*. (Private circulation).

Books for Reference:

1. Furniss, B. S. (1984). *Vogel's Textbook of Practical Chemistry* (7th Ed.). ELBS.

2. Venkateswaran, V., Veeraswamy, R., &Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry* (2nd Ed.). Sultan Chand and Sons.

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=_A3JxpMU63s
2. https://www.youtube.com/watch?v=wq344RYQTe0
3. https://www.youtube.com/watch?v=QacQmS3aaTI&t=10s
4. https://www.youtube.com/watch?v=FUo428guKt0&t=16s
5. https://www.youtube.com/watch?v=FUo428guKt0

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Learn the concept of organic analysis	**K1**
CO2	Learn the methods of preparing Lassaign's extract	**K2**
CO3	Understand the principles of organic reactions	**K3**
CO4	Understand the methods of elemental analysis	**K4**
CO5	Learn the confirmatory tests of functional groups.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
4	**25UBO43OP02A**			**Allied Optional Practical:** Chemistry for Biologist						**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	1	2	2	3	3	2	1	3	2	**2.2**
CO2	2	2	2	3	2	2	1	3	3	2	**2.2**
CO3	3	2	2	3	3	2	3	2	2	3	**2.5**
CO4	2	3	2	3	2	3	3	2	3	2	**2.5**
CO5	3	3	2	1	2	2	2	3	2	1	**2.1**
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO43OP02B	**Allied Optional Practical:** Biometrics and Computer Applications	2	2

Course Objectives
To Learn the basic concepts of statistical test.
To Impart the knowledge small sample and large sample test.
To Know the concept of correlation and regression.
To Learn the various statistical hypothesis tests.
To Know the difference about parametric and non – parametric test.

Using the SPSS software the students are asked to solve the following exercises:

1. Finding Descriptive statistics.
2. Finding correlation coefficient, Rank Correlation, Regression
3. T- tests
4. F-test
5. Chi-square test
6. Non-parametric tests. Sign test-Mann Whitney U test – One sample runs test – Kruskal – Wallis test and Run test for randomness.

Website and eLearning Resources:

1. https://www.youtube.com/watch?v=6nLBDu0I6qo
2. https://latrobe.libguides.com/ibmspss/correlation

Course Outcomes		
CO No.	**CO–Statements**	**Cognitive Levels (K –Levels)**
	On successful completion of this course, students will be able to	
CO-1	Acquire the knowledge of basic statistical test.	**K1**
CO-2	Understand the concept of small and large sample test.	**K2**
CO-3	Compute various statistical measures in the real life problems.	**K3**
CO-4	Apply the hypothesis testing to parametric and non – parametric test.	**K4**
CO-5	Give the interpretations about statistical result.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**				**Hours/Week**			**Credits**
4	**25UBO43OP02B**			**Allied Optional Practical:** Biometrics and Computer Applications				**2**			**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	2	3	2	2	3	2	2.4
CO2	3	2	3	2	3	2	2	3	1	2	2.3
CO3	2	2	3	2	2	3	3	2	2	3	2.4
CO4	3	2	2	3	3	1	2	3	1	3	2.3
CO5	2	3	3	2	1	3	2	2	3	2	2.3
Mean Overall Score											**2.34 (High)**

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

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

UNIT I: Harmony with Nature (6 Hours)

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

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

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

UNIT III: Public Health (6 Hours)

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

UNIT IV: Disaster Management (6 Hours)

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

UNIT V: Counseling for Adolescents (6 Hours)

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

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

Books for Study:

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

Books for Reference:

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

Websites and eLearning Sources:

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

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

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

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

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

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

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

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

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

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

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

Books for Study:

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

Books for Reference:

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

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

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

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25USE44SE02	**Skill Enhancement Course - 2:** Mushroom Technology	2	1

Course Objectives
Identify various cultivable species of mushrooms.
Design various recipes from mushrooms
Assess preservation and storage of mushrooms
Evaluate and explore the economic viability of mushrooms
Prepare the culture techniques of edible mushrooms

UNIT I **(6 Hours)**

Introduction, history, Classification-Edible and Poisonous. Tests for identification, and-Nutritive value of mushrooms.

Unit II **(6 Hours)**

Characteristics of common edible mushrooms Paddy straw, Oyster and milky mushrooms. Life cycle of a common mushroom (Agaricus).

Unit III **(6 Hours)**

Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation-paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation.

Unit IV **(6 Hours)**

Preservation and storage of mushrooms. Short-term storage (Refrigeration) Long term Storage (canning, pickles, papads), drying, storage in saltsolutions. - Diseases and pests of mushrooms.

Unit V **(6 Hours)**

Delicious recipes of mushroom-Economic importance of mushrooms, Research Centres-National level and Regional level. Low cost technology, Composting technology in mushroom production–Harvesting and Marketing. Cost benefit ratio-Marketing in India and abroad, Export Value.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	MCQ

Books for Study:

1. Nita Bahl (1984). Handbook on Mushrooms, Oxford and IBH Publishing Company

Books for Reference:

1. Bandey, R. k., and Ghosh, S. K., (1996). *A Hand Book on Mushroom Cultivation.* Emkey Publications.
2. Pathak, V. N., Yadav, N., and Gaur, M. (2000). *Mushroom Production and Processing Technology.* Vedams ebooks Pvt. Ltd.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Identify various cultivable species of mushrooms.	**K1**
CO2	Design various recipe from mushrooms.	**K2**
CO3	Assess preservation and storage of mushrooms.	**K3**
CO4	Evaluate and explore the economic viability of mushrooms.	**K4**
CO5	Prepare the culture techniques of edible mushrooms.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
4	**25USE44SE02**			**Skill Enhancement Course - 2:** Mushroom Technology					**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	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25UBO44SL03	**Self Learning:** Economic Botany for Sustainable Development	-	2

Course Objectives
To understand the origin, history of economically important plants
To explore the cultivation, harvesting and processing of plants used in agriculture, industry and medicine.
To analyze the economic and ecological significance of plant resources in human society, emphasizing sustainability and conservation.
To develop practical knowledge on the utilization of plant-derived products
To promote entrepreneurship and innovation in plant-based industries by integrating traditional knowledge with modern scientific approaches.

UNIT I: Cereals and Legumes

Origin and history of domestication. Botanical description, cultivation practices and harvesting techniques. Economic importance and nutritional value of major cereals and legumes: Wheat, Rice, Maize, Black gram, Red gram and Chickpea. Traditional and modern breeding techniques for yield improvement. Sustainable agricultural practices and food security concerns.

UNIT II: Vegetables and Fruits

Origin, domestication, and genetic diversity. Botanical characteristics, cultivation methods, and economic importance. Study of key vegetables and fruits: Apple, Banana, Mango, Brinjal, Tomato, and Potato. Nutritional value, post-harvest management and food processing applications. Role of horticulture in urban and peri-urban agriculture.

UNIT III: Spices and Condiments

History, botanical characteristics, and agro-climatic requirements. Cultivation, harvesting, processing, and medicinal properties of Pepper, Cardamom, Clove, Chilly, Coriander, and Turmeric. Phytochemical constituents and their industrial applications. Importance of spices in traditional medicine, food industry, and cosmetics.

UNIT IV: Beverages, Fibres, and Timber Plants

Beverage plants: Origin, cultivation and processing, economic importance of Tea, Coffee, and Cocoa. Fiber plants: Cultivation, extraction, and uses of Cotton and Jute. Timber plants: Botanical aspects, sustainable forestry, economic significance of Teak, Rosewood and Mahogany. Eco-friendly fiber and wood substitutes and their role in climate resilience.

UNIT V: Oil Yielding and Medicinal Plants

Oil crops: Botanical characteristics, extraction techniques, economic uses of Sunflower, Soybean, Coconut and Gingelly. Medicinal plants: Origin, active compounds and therapeutic uses of *Rauwolfia*, *Cinchona* and *Digitalis*. Ethnobotanical knowledge and conservation strategies for medicinal plants. Role of plant-derived oils and medicinal compounds in pharmaceutical and nutraceutical industries.

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

Books for Study:

1. Kochhar, S. L. (2012). *Economic Botany in Tropics*. MacMillan & Co.
2. Panday, B. P. (2000). *Economic Botany*. S. Chand Publishing Company.

Books for Reference:

1. Wickens, G. E. (2001). *Economic Botany: Principles & Practices*. Kluwer Academic Publishers.
2. Chrispeels, M. J., & Sadava, D. E. (2003). *Plants, Genes and Agriculture*. Jones & Bartlett Publish

Websites and eLearning Sources:

1. https://cereal-scientech.blogspot.com/2011/12/economic-importance-of-cereal-grains.html

2. https://dpd.gov.in/iv)%20Economic%20Importance%20&%20Value%20Added%20Products%20of%20%20Pulses.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Gain knowledge about the botanical and economic aspects of cereals	**K1**
CO2	Apply scientific principles to identify	**K2**
CO3	Demonstrate practical skills in processing and value addition of plant-based products	**K3**
CO4	Evaluate the impact of plant-derived resources on human health	**K4**
CO5	Develop an entrepreneurial mindset by exploring opportunities in agro-based industries	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
4	**25UBO44SL03**	**Self Learning:** Economic Botany for Sustainable Development								**-**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53CC09	**Core Course - 9:** Biophysics and Biostatistics	6	5

Course Objectives
To understand the field of biophysics with reference to bioenergetics
To understand the principles of statistics and know the method of calculation
To learn to apply physical principles to biological systems
To apply the statistical principles to solve the biological problems
To analyse the measures of central value and standard deviation

UNIT-I **(18 Hours)**

Biophysics: Photobiology-electromagnetic spectrum, visible rage of spectrum, solar energy and photosynthesis. Influence of light on Phytochrome and its effect on root growth. Phototropin, its significance in plant growth. Fluorescence. Bioluminescence. Phosphorescence.

UNIT-II **(18 Hours)**

Bioenergetics-energy and work. Laws of thermodynamics-concept of entropy and enthalpy. Gibb's free energy-energy transduction in biological systems. High-energy compounds-ATP bioenergetics and energy coupled reactions. Radioactivity-structure of an atom, isotopes, types of radiations, application of radioactive isotopes in biological studies, detection of radiation, autoradiography.

UNIT-III **(18 Hours)**

Biostatistics: Data-primary & secondary; variable-discrete & continuous. Population and sample, sampling techniques, classification of data, frequency distribution-discrete, continuous and cumulative; advantages of classification of data. Parts of a statistical table. Presentation of data-histogram, frequency polygon, Ogive curve, bar charts-simple, subdivided& multiple, pie diagram.

UNIT-IV **(18 Hours)**

Measures of central values: Mean, Median & Mode. Measures of dispersion: Range, Mean deviation&Standard deviation, Coefficient of variation-Skewness. Correlation-definition-types-methods of studying correlation: scatter diagram method and Karl Pearson's coefficient of correlation for simple and linear data. Regression: definition-regression lines.

UNIT-V **(18 Hours)**

Probability-definition, binomial, poison and normal distributions. Tests of significance. General procedure-large sample testing & small sample testing: t-Test, Chi-squire test and F test

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

Books for Study:

1. Fabrizio, C. (2016). *The physics of living systems*. Springer International Publishing.

Books for Reference:

1. Mishra, S. R. (2010). *Textbook of Photobiology*. Discovery Publishing Pvt. Ltd.
2. Gupta, S. P. (2008). *Elementary Statistical Methods*.Sultan Chand & Sons.

Websites and eLearning Sources:

1. https://opentextbc.ca/biology/chapter/5-1-overview-of-photosynthesis/
2. http://www.biosciencenotes.com/bioenergetics/
3. https://www.osmosis.org/notes/Introductory_Biostatistics

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recognize the structure and dynamics of macro molecules, cells and tissues	**K1**
CO2	Realize energy transformation and transfer; thermodynamics	**K2**
CO3	Understand and use statistical theory underlying the application of biostatistical methods	**K3**
CO4	Analyze the different type of data using appropriate statistical software.	**K4**
CO5	Demonstrate a good understanding of descriptive statistics and graphical tools.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UBO53CC09**			**Core Course - 9:** Biophysics and Biostatistics						**6**	**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	3	2	2	1	2	**2.2**
CO2	2	3	1	2	3	3	2	2	2	2	**2.2**
CO3	2	3	1	2	2	2	2	2	1	2	**1.9**
CO4	2	2	2	2	1	2	2	2	1	2	**1.8**
CO5	2	2	1	3	3	2	3	2	2	2	**2.3**
										Mean Overall Score	**2.1 (Medium)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53CC10	**Core Course - 10:** Microbiology and Immunology	6	4

Course Objectives
To provide students with basic understanding of Structure and organization of bacteria.
To understand the application of microbes in food and dairy microbiology.
To provide comparative analysis of major groups of microbes.
To be aware about the immune systems of human being.
To know about the antibody production and their immunological role.

Unit I **(18 Hours)**

Microbiology: History and mile stones in microbiology. Contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, IvanowskyWhittaker's five kingdom concept. General characteristic of bacteria-Outline classification of Bergey's manual of 9th edition. Growth, nutrition and reproduction of bacteria. Viruses: structure, classification and reproduction-lytic and lysogenic cycle. A brief account on Rickettsias, Chlamydia, Mycoplasmas, Viroids and Prions.

Unit II **(18 Hours)**

Culture of microorganisms: Pure cultures, batch and continuous cultures. Methods of Preservation of microorganisms. Microorganisms and Human diseases: Food borne (Botulism), water borne (cholera), air borne (tuberculosis), vector borne (malaria) and contact diseases (AIDS) and SARS. Control of microorganisms-physical, chemical and biological methods.

Unit III **(18 Hours)**

Soil Microbes and Their Roles: Improvements in Soil Fertility, Nitrogen Fixing Bacteria and Their Role in Nitrogen Cycle, Mycorrhizae: Plant-Microbes Interactions, Ectomycorrhizae and Endomycorrhizae. Food microbiology: Types of food spoilage and methods of food preservation. Dairy microbiology: Fermented dairy products. Industrial microbiology: Fermentation and Industrial production of Ethanol and antibiotics.

Unit IV **(18 Hours)**

Immunology: Immune system-adaptive, innate, humoral and cellular immunity. Origin, structure and immunological role of primary lymphoid organs (bone marrow and thymus) and Secondary lymphoid organs (Spleen, lymph nodes, Payer's patches, tonsils).

Unit V **(18 Hours)**

Origin and role of immune cells: Lymph: composition and functions. Antigen -Antibody Structure, types, Interactions, Physical and Chemical Barriers, Cytokines and Chemokines, Autoimmune Diseases (Rheumatoid Arthritis).

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

Books for Study:

1. Pelczar J Chan ECS and Krieg, R. (1999). *Microbiology*, Tata McGraw Hill, New Delhi.
2. Sullia S Band Shantharam S (2005). *General microbiology*. Oxford & IBH
3. P. Madhavee Latha (2012). Textbook of Immunology, S. Chand Publishing, Delhi
4. Anil K. Sharma (2019) Immunology: An Introductory Textbook, Jenny Stanford Publishing, Delhi

Books for Reference:

1. Dubey R Cand Maheshwari DK. (2004). *A text book of microbiology*. S. Chand New Delhi.
2. Casida LE, (2005). *Industrial Microbiology*.New Age International.
3. Arvind Kumar (2014) Textbook of Immunology, TERI Press, New Delhi
4. Subhash Chandra Parija (2012) Textbook of Microbiology & Immunology, Elsevier Health Sciences

Websites and eLearning Sources:

1. https://www.youtube.com/playlist?list=PL0lgiXDBo2olviMsZ6zWDeOCcej7cYx4I
2. https://www.youtube.com/watch?v=plmdIUsqCq4
3. https://www.youtube.com/watch?v=ACYSUXNSsMM
4. https://www.youtube.com/watch?app=desktop&v=MvNpSXIurPQ
5. https://www.youtube.com/playlist?list=PLc_SwOK0df2UnB3UvyDeEqVvtFEAEjLyJ

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand the various types of microbes in an environment and their importance.	**K1**
CO2	Comprehend the structure and function of immune system in humans.	**K2**
CO3	Demonstrate the role of microorganisms in food processing and spoilage, soil fertility and sewage disposal	**K3**
CO4	Identify the defense mechanism against infection in humans.	**K4**
CO5	Assess role of microorganisms in industrial processing of microbial products	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
5	**25UBO53CC10**		**Core Course - 10:** Microbiology and Immunology						**6**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	2	2	2.3
CO2	2	3	2	2	1	2	3	2	2	2	2.1
CO3	2	2	3	2	2	3	3	2	3	1	2.3
CO4	3	3	2	1	1	3	2	2	1	2	2.1
CO5	2	3	2	2	3	1	3	2	1	3	2.4
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53CP05	**Core Practical - 5:** Biophysics, Biostatistics, Ecology, Climate Change and Conservation	3	1

Biophysics

1. Separation of cell and tissue components by centrifugation
2. Separation of pigments by Paper chromatography
3. Absorption spectrum of macromolecules and pigments-UV, FTIR

Biostatistics

1. Sampling by Random Number Table
2. Data Collection
3. Classification of Data: Discrete, continuous and cumulative.
4. Statistical diagrams: Histogram, Frequency curve, Bar chart and Ogive curve
5. Measures of Central Values: Mean, Median and Mode
6. Measures of Dispersion: Range, Mean Deviation and Standard Deviation.

Ecology and Climate Change

1. Chemical analysis of water and Soil-Total hardness, Carbonates and Bicarbonates and Dissolved oxygen.
2. Vegetation Analysis: Quadrat, Line transects, Species Density, abundance and richness. Basal area and relative dominance
3. Field trip.

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53CP06	**Core Practical - 6:** Microbiology and Immunology	3	1

Microbiology

1. Preparation of common media (Nutrient agar, Nutrient Broth and Potato dextrose agar).
2. Staining of Bacteria (Simple &Grams staining).
3. Isolation and enumeration of microbes in soil and (serial dilution).
4. Isolation of Microorganisms from Air and water
5. Study of motility by Hanging Drop.
6. Pure cultures of bacteria–Streak plate, Pour plate and Spread plate.
7. Qualitative tests for milk (Phosphatase and and Methylene Blue Reduction Test)
8. Antibiosis-Kirby Baur method

Immunology

1. Blood grouping
2. WIDAL-test for typhoid
3. RPR-test for syphilis
4. RF-test for rheumatoid arthritis
5. Immunoelectrophoresis–Demo
6. ELISA-Demo

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53ES01A	**Discipline Specific Elective – 1:** Ecology, Climate Change and Conservation	4	3

Course Objectives
To understand the fundamentals of ecology
To acquire know on various ecosystems and their components
To understand techniques of community studies
To apply their skill to manage climate change
To analyse the biogeochemical cycles and their significance

Unit I: Ecology and Ecosystem Dynamics (12 Hours)

Fundamentals of Ecology: Ecosystem structure, components and functions. Food chain, food web and energy flow. Biogeochemical cycles: C, N & P cycles. Community dynamics: Succession, climax concept and ecological indicators. Anthropogenic impacts on ecosystems: Urbanization, habitat fragmentation and ecological restoration. Sacred groves and their role in biodiversity conservation.

Unit II: Climate Change and Carbon Management (12 Hours)

Global warming and anthropogenic climatic consequences: climate crisis, greenhouse effect, ozone depletion and acid rain. Carbon emissions: Causes, consequences and mitigation. Role of carbon credits and carbon sequestration. Blue carbon and alternative energy sources. Climate conferences: CoP, IPCC and UNFCCC. Green auditing.

Unit III: Biodiversity and Conservation Strategies (12 Hours)

Types of biodiversity: Genetic, species, and ecosystem diversity. Endemism and biodiversity hotspots: Criteria and hotspots of India. Natural resource conservation: *In situ* and *Ex situ* approaches. Seed banks and conservation of genetic resources: Importance and applications. Deforestation consequences. Indigenous conservation practices.

Unit IV: Pollution and Environmental Toxicology (12 Hours)

Types of pollution: Air, water, soil, noise, radioactive and thermal pollution. Primary vs. secondary pollutants. Eutrophication. Environmental toxicology: Pesticides, heavy metals and persistent organic pollutants (POPs). Microplastics and emerging pollutants: Impacts on ecosystems and human health. Remedial measures: Bioremediation, green technology and nature-based solutions. Indigenous farming: Sustainable and organic cultivation practices.

Unit V: Phytogeography (12 Hours)

Phytogeography: Concepts of continuous and discontinuous distribution. Phytogeographical regions of India. Vegetation regions of India: Classification and characteristics. Plant indicators and their ecological significance. Island Biogeography and diversification of land plants. Classification of indigenous ecological zones.

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

Books for Study:

1. Kormondy, E.J. (2017). *Concepts of Ecology*. Prentice Hall, U.S.A. 4th edition.

Books for Reference:

1. Sharma, P.D. (2010). *Ecology and Environment*. Rastogi Publications, Meerut, India. (8th edition).
2. Eugene Odum, (2017). *Fundamentals of Ecology* (5th Ed). Cengage, Bengaluru.
3. Sharma P.D. (2019). *Plant ecology and phytogeography*, Rastogi Publications, Meerut.
4. Alexander von Humboldt, AimeBonpl and, Stephen T. Jackson (eds.) (2013). *Essay on the Geography of Plants*, University of Chicago Press.

Websites and eLearning Sources:

1. https://bio.libretexts.org/Bookshelves/Ecology/Environmental_Science_(Ha_and_Schleiger)/02%3A_Ecology/2.04%3A_Ecosystems/2.4.03%3A_Biogeochemical_Cycles
2. https://www.agritech.tnau.ac.in/agriculture/agri_min_nutri_plantsampling.html
3. https://www.ipcc.ch/
4. https://unfccc.int/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand the fundamentals of ecology	**K1**
CO2	Acquire know on various ecosystems and their components	**K2**
CO3	Understand techniques of community studies	**K3**
CO4	Apply their skill to manage climate change	**K4**
CO5	Analyse the biogeochemical cycles and their significance	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
5	**25UBO53ES01A**	**Discipline Specific Elective - 1:** Ecology, Climate Change and Conservation								**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	2	2	2	2	2.2
CO2	2	3	2	2	3	3	2	2	2	2	2.3
CO3	2	3	2	2	2	2	2	2	2	2	2.1
CO4	2	2	3	2	2	2	2	2	2	3	2.2
CO5	2	2	2	3	3	2	3	2	2	2	2.3
Mean Overall Score											**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53ES01B	**Discipline Specific Elective - 1:** Bioinformatics and Nanotechnology	4	3

Course Objectives
To introduce students to the fundamental concepts of bioinformatics and its role in biological research.
To familiarize students with biological databases and sequence alignment tools for analyzing DNA and protein sequences.
To provide an understanding of the principles, properties, and synthesis methods of nanomaterials.
To train students in the techniques used for nanoparticle characterization and their applications in various fields.
To explore the applications of nanotechnology in medicine, agriculture, and environmental management while addressing safety concerns.

UNIT I: Introduction to Bioinformatics (12 Hours)

Definition, Aim, Scope, and Research Areas of Bioinformatics. Branches of Bioinformatics. Biological Databases: Types, Formats, and Retrieval Systems. Major Biological Databases: NCBI, PUBMED, EBI, EMBL, GenBank.

UNIT II: Sequence Alignment and Homology Search (12 Hours)

Homology search using BLAST and FASTA. Interpretation of DNA/Protein sequence alignment results. Algorithms for sequence alignment: Pairwise and Multiple Sequence Alignment. Phylogenetic Analysis and its Applications.

UNIT III: Fundamentals of Nanotechnology (12 Hours)

Introduction, Scope, and Importance of Nanotechnology. Definition and Classification of Nanoparticles. Quantum Effects: Relationship between Size and Surface Reactivity. Properties of Nanoparticles: Size, Shape, Surface Composition, and Solubility.

UNIT IV: Synthesis and Characterization of Nanomaterials (12 Hours)

Approaches to Nanoparticle Synthesis: Top-down vs. Bottom-up. Methods of Nanoparticle Synthesis: Physical, Chemical, and Biogenic (using Plants and Microorganisms). Role of Biomolecules as Reducing and Capping Agents (Proteins, Carbohydrates, Viruses). Techniques for Nanoparticle Characterization: UV-Vis Spectroscopy, FTIR, SEM, DLS, Zeta Potential, X-ray Diffraction.

UNIT V: Applications and Impacts of Nanotechnology (12 Hours)

Targeted Nanoparticles: Active and Passive Targeting. Applications in Medicine, Drug Delivery, Cancer Therapy, and Tissue Engineering. Nanotechnology in Agriculture: Fertilizers, Pesticides, and Crop Protection. Environmental and Toxicological Impact of Nanoparticles. Role of Nanotechnology in Biosensors, Nano-Imaging, and Gene Therapy.

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

Books for Study:

1. Sharon, M. & Sharon, M (2012). *Bio-Nanotechnology- Concepts and Applications*, CRC Press.
2. Atkinson WI. (2011). *Nanotechnology*. Jaico Book House, New Delhi.
3. Imtiaz Alam Khan. (2005). *Elementary bioinformatics*. Pharma Book Syndicate, Hyderabad.
4. Rastogi, S.C., Mediratttta, N. and Rastogi. P. (2004). *Bioinformatics, methods andapplications, genomics, proteomics and drug discovery,* Prentice hall of India, Pvt. Ltd., New
5. Delhi.
6. Nalwa HS. (2005). *Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology.* American Scientific Publ.

Books for Reference:

1. Barbara Panessa-Warren, (2006) *Understanding cell-nanoparticle interactions making nanoparticles more biocompatible.* Brookhaven National Laboratory

2. European Commission, SCENIHR, (2006). *Potential risks associated with engineered and adventitious products of nanotechnologies,* European Union
3. Gysell Mortimer, (2011). *The interaction of synthetic nanoparticles with biological systems PhD Thesis, School of Biomedical Sciences,* Univ.of Queensland.
4. Jain K.K. *Nanobiotechnology molecular diagnostics: Current techniques and application* (Horizon Bioscience) (2006) Taylor & Francis 1st edition.

Websites and eLearning Sources:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/
2. https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html
3. http://www.particle-works.com/applications/controlled-drug-release/Applications

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Demonstrate knowledge of bioinformatics tools and databases, enabling them to retrieve and analyze biological data.	**K1**
CO2	Apply sequence alignment techniques to identify homology and evolutionary relationships among DNA and protein sequences.	**K2**
CO3	Explain the fundamental principles of nanotechnology, including nanoparticle properties and synthesis methods.	**K3**
CO4	Utilize different characterization techniques to analyze nanoparticles and interpret their structural and functional attributes.	**K4**
CO5	Assess the applications and impact of nanotechnology in various domains, including biomedicine, agriculture, and environmental sciences.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
5	**25UBO53ES01B**			**Discipline Specific Elective - 1:** Bioinformatics and Nanotechnology					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53ES02A	**Discipline Specific Elective - 2:** Molecular Biology	4	3

Course Objectives
To understand the Organization of the Genome including mobile genetic elements.
To analyse DNA Replication and Repair Mechanisms in maintaining genomic stability.
To comprehend Gene Expression and Regulation in prokaryotes and eukaryotes.
To examine the Role of Mutations along with the role of RNA interference and regulatory RNAs in gene expression.
To apply Molecular Biology Concepts to Research and Biotechnology.

UNIT I: Genome Organization and Mutations (12 Hours)

Genome organization – Prokaryotic vs. eukaryotic genome, differences in structure and complexity. Linear and circular DNA, extrachromosomal DNA. Mutations – Definition, types, causes and detection. Mutant types and mutagenesis. Mobile genetic elements and their role in genome evolution.

UNIT II: DNA Replication and Repair Mechanisms (12 Hours)

DNA replication – Features, enzymology, models of replication. Replication mechanism in prokaryotes and eukaryotes. DNA damage and their effects on genome stability. DNA repair mechanisms – Excision repair, mismatch repair, recombination repair, double-strand break repair, SOS response.

UNIT III: Transcription and RNA Processing (12 Hours)

The Central Dogma of Molecular Biology. Transcription mechanism – RNA polymerase structure and function, promoters, enhancers, silencers. Regulation of transcription – General transcription factors, initiation, elongation, termination in prokaryotes and eukaryotes. Post-transcriptional modifications – mRNA splicing, capping and polyadenylation, significance in gene expression.

UNIT IV: Translation and Post-Translational Modifications (12 Hours)

Organization of mRNA, Ribosome and rRNA – Role in translation, structure in prokaryotes vs. eukaryotes. Genetic code characterization – Codon-anticodon recognition, wobble hypothesis. Aminoacyl-tRNA synthetase and amino acid activation – Mechanism and significance. Translation process – Initiation, elongation, and termination in prokaryotes and eukaryotes. Post-translational modifications.

UNIT V: Gene Regulation and RNA-Based Control (12 Hours)

Basic principles of gene regulation – Positive and negative regulation, inducible and repressible systems. Bacterial gene regulation – The lac operon (positive and negative control), the trp operon (repression-derepression and attenuation). Regulatory RNAs – Riboswitches, microRNAs, small interfering RNAs (siRNAs), and RNA interference (RNAi). mRNA stability and degradation – Factors affecting gene expression at the RNA level.

Teaching Methodology	Chart, PPT, videos and practical demonstration
Assessment Methods	Seminar, Snap Test, MCQ

Books for Study:

1. Freifelder, D. (1993). *Essentials of Molecular Biology*. Jones & Bartlett.
2. Gupta, P. K. (2005). *Molecular Biology and Genetic Engineering*. Rastogi Publications.
3. Wilson, K., &Walker, J. (2010). *Principles and Techniques of Biochemistry and Molecular Biology.*

Books for Reference:

1. De Robertis & De Robertis. (1990). *Cell and Molecular Biology*. Saunders College, Philadelphia.
2. Elliott, W.H., & Elliott, D.C. (2005). *Biochemistry and Molecular Biology*, (3rd Ed.). Oxford University.

Websites and eLearning Sources:

1. https://www.nature.com/scitable/definition/transcription-dna-transcription-87/

2. https://www.ncbi.nlm.nih.gov/books/NBK26887/
3. https://courses.lumenlearning.com/wm-biology1/chapter/reading-steps-of-genetic-transcription/

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 structural and functional differences between prokaryotic and eukaryotic genomes and their evolutionary significance.	**K1**
CO2	Explain the mechanisms of DNA replication, repair, and mutation formation, and their impact on genetic stability and disease.	**K2**
CO3	Demonstrate knowledge of gene expression and regulation at the transcriptional and translational levels in prokaryotic and eukaryotic systems.	**K3**
CO4	Analyse the role of RNA-based gene regulation mechanisms, including riboswitches, RNA interference, and microRNAs, in controlling gene expression.	**K4**
CO5	Apply molecular genetics concepts in biotechnology and medical research, including genome editing, synthetic biology, and functional genomics.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UBO53ES02A**			**Discipline Specific Elective - 2:** Molecular Biology						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO53ES02B	**Discipline Specific Elective - 2:** Research Methodology	4	3

Course Objectives
To obtain knowledge on basic on captain research.
To introduce students to scientific research methodologies in biological sciences.
To develop skills in experimental design, data collection, and analysis.
To familiarize students with scientific writing, publication ethics, and research communication.
To provide knowledge about statistical tools and software used in biological research.

UNIT-I **(12 Hours)**

Research: Meaning, Definition and Objectives. Hypothesis: definition and types. Understanding the language of research-Concept, Construct, Variable. Research Process.

UNIT-II **(12 Hours)**

Research Design: Concept, classification and Importance in Research. Sampling Methods in Biological Research, Laboratory Techniques, Light Microscopy, Spectroscopy, and Molecular Biology Techniques.

UNIT-III **(12 Hours)**

Bio safety Levels & Handling of Biological Samples, Ethical Considerations in Animal and Human Research, Bibliometrics: definition and relevance; Citation Styles (APA, MLA, Vancouver),

UNIT-IV **(12 Hours)**

Interpretation of Data and Paper Writing. Types of manuscript in journals. Layout of a Research paper and proof correction. Journals in Life sciences, Impact factor of Journals, Scopus, Web of Sciences, Peer Review Process, Preparing Research Posters and Oral Presentations.

UNIT-V **(12 Hours)**

Structure of thesis. Literature collection: Books, Research articles and e-resources. Structure and components of research proposal, Use of AI in Research Writing and Presentation, National and International funding sources. Research Metrics: Significance of Journal, Cite Score, Metrics: h-index, and i10 index, Plagiarism and Software for detection of Plagiarism (Turnitin and iThenticate).

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

Books for Study:

1. Kothari, C. R. (2014). *Research Methodology-Methods & Techniques*. Wishwa Prakashan
2. Misra, R. P. (2000). *Research Methodology- A Handbook*. Concept Pub. Company.
3. Pillai & Bagavathi. (2008). *Statistics*. S. Chand & Company Ltd

Books for Reference:

1. Gupta, S. P. (1990). *Statistical Methods.* Sultan Chand & Sons.
2. Rao, N. G. (1983). *Statistics for Agricultural Science.*Oxford & IBH.
3. Creswell, J.W., & Creswell, J.D**.** (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th Edition).* SAGE Publications

Websites and eLearning Sources:

1. https://www.trueeditors.com/blog/components-of-a-thesis/
2. https://www.aresearchguide.com/4format.html
3. https://www.youtube.com/watch?v=GSeeyJVD0JU
4. https://www.youtube.com/watch?v=wBA4U4wjWkA

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand and comprehend the basics in research methodology and Applying them in research/project work.	**K1**
CO2	Demonstrate the ability to choose methods appropriate to research objectives.	**K2**
CO3	Develop advanced critical thinking skills and demonstrate enhanced writing skills	**K3**
CO4	Help them to select an appropriate research design	**K4**
CO5	Enable them to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate students prosperity in higher education.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UBO53ES02B**			**Discipline Specific Elective - 2:** Research Methodology						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	2	3	2	2	1	**2.2**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	1	3	3	2	3	1	**2.4**
CO5	2	2	2	2	1	2	2	2	2	1	**1.8**
										Mean Overall Score	**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO54OE01	**Open Elective - 1 (WS):** Aquaculture	4	2

Course Objectives
Understand the scope, site selection, and pond management in aquaculture.
Learn seed collection, breeding techniques, and culture practices of major aquatic species
Explore different aquaculture systems, including monoculture, polyculture, and integrated farming.
Gain knowledge of fish nutrition, feed formulation, and disease management.
Understand fish harvesting methods, preservation techniques, and the role of government organizations.

UNIT I Introduction (12 Hours)

Scope of Aquaculture - Aquaculture in India – Freshwater, Coastal and Marine aquaculture –Site selection- Pond construction - Maintenance of pond - Types of fish ponds- Nurserypond, Rearingpond and culture pond. Traditional Aquaculture Practices in India (Bheri Culture, Ghery System)

UNIT II Culture Practices (12 Hours)

Biology of Indian major carps –Fin fish culture: collection of seeds and transportation of seeds – induced breeding, Marine prawn culture –*Penaeus monodon*, Culture practices in edible oyster, Indigenous Knowledge in seed Collection and breeding use herbal extract.

UNIT III Types of Culture (12 Hours)

Types of culture: extensive - semi-intensive and intensive culture – monoculture - monosex culture – polyculture - cage culture - pen culture – seaweed culture - integrated fish farming – paddy cum fish culture - poultry cum fish culture - pig cum fish culture.

UNIT IV Aqua Feed and Diseases (12 Hours)

Aqua feed: artificial feed – feed formulation – need - ingredients ratio – square method– pellets. Live feeds and their culture: *Artemia* and Rotifer – Seaweed culture. Fish Diseases: bacterial, viral, fungal, nutritional deficiency diseases.

UNIT V Harvesting and Post-harvest Technology (12 Hours)

Methods of fish harvesting – craft (Kattumaram and Trawlers) and gears (Gill net and trap net)-Traditional fish preservation and Processing Technique -Sun Drying & Smoking, Salt Curing. Role of government organizations-CMFRI – CIFRI – FFDA - CIFT – CIFE - MPEDA – CIBA etc

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

Books for Study:

1. Sandhu, G.S. 2010. A text book of fish and Fisheries of India. Wisdom Press, New Delhi.
2. N. Arumugam, Saras Publications, 114/35G, A.R.P. Camp Road, Periyavilai, Kottar Po, Nagercoil – 629002.
3. Mohan Joseph Modayil and Pillai, N.G.K. 2007. Status and perspectives of Marine fishery research in India. CMFRI Publications, Kochi.
4. Mohan Joseph Modayil and Jayaprakash, A.A. 2003. Status of exploitory marine fisheries research of India. CMFRI Publications, Kochi

Books for Reference:

1. Jhingran, V.G. Fish and fisheries of India. Hindustan Publishing Corporation (India), Delhi
2. Santhanam, R., N. Sukumaran and P. Natarajan., A manual of freshwater aquaculture. Oxford & IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi.
3. Sundararaj, V. and B. Srikrishnadhas, Cultivable aquatic organisms, Narendra Publishing House, 1417, Krishnan Dutt Street, Maliwara, Delhi.
4. Pillai, T.V.R., Aquaculture and the environment. 1st edition, Fishing news Books, England, 1992
5. Samuel Paulraj., Shrimp farming techniques, problems and solutions-1995

Websites and eLearning Sources:

1. https://www.youtube.com/watch?v=YGaFNZzjCXI
2. https://www.youtube.com/watch?v=OXOXn_5PtNI
3. https://www.youtube.com/watch?v=k6U3IgT1lVQ

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Define the scope of aquaculture, site selection, and pond management techniques.	**K1**
CO2	Explain seed collection, breeding techniques, and culture practices of major aquatic species.	**K2**
CO3	Classify different aquaculture systems, including monoculture, polyculture, and integrated farming.	**K3**
CO4	Assess fish nutrition, feed formulation strategies, and disease management techniques.	**K4**
CO5	Evaluate fish harvesting methods, preservation techniques, and the role of government organizations in aquaculture development.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
5	**25UBO54OE01**			**Open Elective - 1 (WS):** Aquaculture						**4**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**SO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	2	2	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	1	2	**2.1**
Mean Overall Score											**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
5	25UBO54SL04	**Certificate Course:** Inland Fisheries	-	2

Course Objectives
To provide fundamental knowledge of freshwater aquaculture and its importance in the fisheries sector.
To familiarize students with the culture techniques of Indian and exotic freshwater fish species.
To understand hatchery management techniques for fish and freshwater prawns.
To introduce the concept of freshwater prawn and pearl culture and their economic significance.
To develop skills in ornamental fish culture, aquarium maintenance, and disease management.

UNIT-I

Culture of Indian Major Carps: Catla, Rohu, Mrigal, **Culture of Exotic Carps:** Grass carp, common carp, silver carp, Tilapia, Culture of Air Breathing Fishes-Murrels and cat fishes.

UNIT-II

Hatchery Management: Fish: Induced breeding; hypophysation of Indian Major carps; types of hatcheries-Hapa, Jarhatchery, circular hatchery, Freshwater Prawn: Identification of post larval stages; brood stock management, breeding and Hatchery management, larval rearing.

UNIT-III

Freshwater Culture: Seed collection from natural sources; culture of *M. rosenbergii,* pearl producing molluscs; freshwater pearl culture in the world and in India; types of pearls; mantle cavity insertion, mantle tissue insertion, gonadal insertion; water quality management.

UNIT-IV

Aquarium Fishes and Management: Identification of commercially important ornamental fishes, setting and design of freshwater aquarium; physiochemical properties of water used in aquaria; aquatic plants and other structures for beauty and utility.

UNIT-V

Aquarium diseases and Feed Preparation: Common aquarium fish diseases and their control; preparation of supplementary feeds, Fish preservation and Fish by products.

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

Books for Study:

1. Jhingran, V.G. (1991). *Fish and Fisheries of India.*
2. Bardach, J.E., Ryther, J.H., & McLarney, W.O. (1972). *Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms.*
3. Pillay, T. V. R. (1998). *Aquaculture Principles and Practices.* The Fishing News Books.
4. Rath, R. K. (2000). *Freshwater Aquaculture*. Scientific Publishers (India) Jodhpur.

Books for Reference:

1. FAO Aquaculture Guidelines and Reports (Online Resources).
2. New, M.B. (2002). *Farming Freshwater Prawns: A Manual for the Culture of the Giant River Prawn.* FAO Fisheries Technical Paper.
3. Bardach, J.E., Ryther, J.H., & McLarney, W.O. (1972). *Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms.*

Websites and eLearning Sources:

1. https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/
2. https://www.youtube.com/watch?v=7aZTdOi9ej4
3. https://www.youtube.com/watch?v=R9_IE8sKRro
4. https://www.youtube.com/watch?v=julW8UQEYZ4

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand the culture techniques of Indian major carps, exotic carps, and air-breathing fishes.	**K1**
CO2	Apply hatchery management techniques for fish and freshwater prawn breeding.	**K2**
CO3	Demonstrate fresh water prawn and pearl culture methods.	**K3**
CO4	Manage freshwater aquariums, including fish selection, water quality, and disease control.	**K4**
CO5	Evaluate sustainable aquaculture practices and their economic significance.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
5	**25UBO54SL04**		**Certificate Course:** Inland Fisheries							**-**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	2.4
CO2	2	3	2	3	2	2	3	2	2	1	2.2
CO3	2	2	3	1	1	3	1	2	3	1	1.9
CO4	3	3	2	3	1	3	3	2	3	1	2.4
CO5	1	2	2	1	1	2	2	2	2	1	1.6
										Mean Overall Score	**2.1(High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63CC11	**Core Course - 11:** Plant Physiology	6	5

Course Objectives
To learn the underlying principles of various physiological process of plants in relation to water
To study and understand nutrition in plants and nitrogen metabolism
To understand the various mechanism of photosynthesis in plants.
To understand the various mechanism of respiration process in plants
To learn the various action of plant regulator and its physiological function in relations to various Morphogenetic activities.

UNIT-I **(18 Hours)**

Molecular Structure and properties of water. Diffusion and osmosis- osmotic pressure, turgor pressure and significance of osmosis. Plasmolysis and its importance. Mechanism of absorption of water-passive and active absorption. Aquaporins. Ascent of sap-theories on absorption. Absorption, mechanism and transport of mineral salts. Transpiration-types, mechanism, significance, factors affecting transpiration and Guttation.

UNIT-II **(18 Hours)**

Mineral nutrition: plant nutrients-essential and non-essential elements-micro and macro nutrients. Source, physiological role and deficiency symptoms of minerals. Hydroponic and Aeroponic systems Nitrogen metabolism: importance of nitrogento plants. Sources of nitrogen, nitrogen cycle, nitrogen, ammonium assimilation and transamination.

UNIT-III **(18 Hours)**

Photosynthesis: Photosynthetic apparatus and pigment system, Emerson Enhancement Effect and two pigment systems, Antenna complexes and reaction centres, Photosynthetic electron transport system and its mechanism, photo phosphorylation and types -cyclic, non-cyclic, and significance. Path way of carbon, CO2 fixation-C3, C4 and CAM plants.

UNIT-IV **(18 Hours)**

Respiration: Definition, types of respiration: Glycolysis (EMP pathway), Krebs cycle, Terminal oxidation, Electron transport chain (modern view) and oxidative phosphorylation. Pentose Phosphate pathway: its significance, Respiratory Quotient.

UNIT-V **(18 Hours)**

Plant Growth: Plant growth substance: discovery and physiological effects of Auxin, Gibberellins and cytokinins. and their uses in agricultural and horticultural crops, Growth inhibitor hormone: Ethylene and Abscisic acid. Physiology of flowering: Photoperiodism, photoperiodic induction and Phytochrome, Vernalisation: perceptiontechniques, mechanism, and devernalization. Seed dormancy and germination: physiological and biochemical changes. Stress physiology.

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

Books for Study:

1. Verma, V. (2007). *Textbook of Plant Physiology*. Ane Books India.
2. Jain, V. K. (2020). *Fundamentals of Plant Physiology*, (19thEd.). Chand & Co.
3. Pandey, S. N., & Sinha, B. K. (2006). *Plant Physiology*, (4th Ed.). Vikas Publishing House Ltd.

Books for Reference:

1. Noggle., & Fritz. (1976). *Introductory Plant Physiology*. Prentice Hall.
2. Baijal, B. D., & Ravisharma. (1981). *A Textbook of Plant Physiology*. Shiva LalAgarwal
3. Salisbury, F. B., & Ross, C. N. (2006). *Plant Physiology*. CBS Publishers.

Websites and eLearning Sources:

1. https://unacademy.com/content/neet-ug/study-material/biology/plant-water-relation.
2. https://www.agry.purdue.edu/ext/pubs/agry.

3. https://www.toppr.com/guides/biology/mineral-nutrition/metabolism-of-nitrogen.
4. https://www.youtube.com/watch?v=XSMjfvpDtTY.
5. https://unacademy.com/content/wp-content//Respiration-in-Plants.
6. https://bio.libretexts.org/Bookshelves/Botany/.

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 describe fundamental principles of plant physiology, such as water relations, nutrientuptake, photo synthesis, and respiration, demonstrating basic knowledge retention.	**K1**
CO2	Explain the intricate molecular and cellular mechanisms underlying key physiological processes in plants, show casing a deeper understanding of plant physiology concepts.	**K2**
CO3	Applying advanced knowledge of plant physiology to design and conduct various experiments, demonstrating the ability to integrate theoretical concepts into practical research.	**K3**
CO4	Analyse and interpret complex data sets related to plant physiological experiments, Showcasing proficiency in data analysis and critical thinking skills.	**K4**
CO5	Communicate scientific findings effectively through well-structured written reports and articulate presentations, demonstrating advanced communication skills tailored to diverse audiences.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UBO63CC11**			**Core Course - 11:** Plant Physiology						**6**	**5**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	1	2	3	1	2	3	**2.1**
CO2	2	2	3	1	2	3	2	2	3	2	**2.2**
CO3	1	3	2	2	3	1	2	3	2	3	**2.2**
CO4	2	3	2	3	1	2	3	1	2	3	**2.3**
CO5	1	3	3	2	2	2	3	2	1	3	**2.2**
Mean Overall Score											**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63CC12	**Core Course - 12:** Genetic Engineering and Biotechnology	6	4

Course Objectives
Define the principles and application of intellectual property rights.
Understand the principles of genetic engineering.
Learn the types and application of cloning vectors.
Study and analyze different types of gene transfer methods.
Design protocol for plant tissue culture.

Unit I **(18 Hours)**

Basic principle and important steps in recombinant DNA Technology. *Agrobacterium*-mediated gene transfer and Crown gall disease. Hairy Root Culture. Steps in Methods to generate desired foreign genes: isolation of prokaryotic gene by restriction enzymes and of eukaryotic gene by cDNA synthesis. Joining DNA molecules: ligases, linkers and homopolymers.

Unit II **(18 Hours)**

Cloning vectors: natural vectors-E. coli plasmids; *in vitro* vectors-pBR; cosmids; single-stranded DNA vectors-M13; and shuttle vectors-*E. coli*; Yeast shuttle vector. Selectable markers. Gene cloning strategies: cDNA library and genomic library.

Unit III **(18 Hours)**

Methods of gene transfer to bacteria, plants and animals: Ca-transfection, microinjection, electroporation, shotgun, lipofection, somatic cell nuclear transfer, and embryonic stem cells.

Unit IV **(18 Hours)**

Various methods of Plant Tissue Culture and Applications. Protoplast fusion technology. Applications of plant tissue culture in agriculture and forestry. Transgenic plants against herbicide, insects, drought and salinity. Genetic Use Restriction Technology. Anti-sense RNA technology and the FlavrSavr tomato.

Unit V **(18 Hours)**

Production technology of plantibodies and monoclonal antibodies by hybridoma technology. Gene therapy. Cloning animals (therapeutic and reproductive). Xenografting. Release of GMOs: *Bt*brinjal in India. Concerns of genetic engineering. IPRs-meaning, types (IP, Copyrights & Patents). Arguments for and against patenting genes and life forms.

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

Books for Study:

1. Bernard R G lick and Jack J P asternak. 2001.Molecular biotechnology – principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.
2. R W and Primrose, SB. 2001. Principles of Gene Manipulation - an introduction to genetic engineering, Black Well Science Ltd., New York.

Books for Reference:

1. Gamborg, OL and Philllips, GC. 1995. Plantcell, Tissue and Organ culture, Narosa publishing House, New Delhi.
2. George, EF and Sherrington, PD.1984.Plant propagation by Tissue culture, Exegetics Limited, London.
3. JDWatson, MGilman, J Witkowski and MZoller 1992.Recombinant DNA (2nd Edition), WH Freeman Co., New York.

Websites and eLearning Sources:

1. https://biotech.iitm.ac.in/
2. https://www.genengnews.com/

3. https://btisnet.gov.in/

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 principles of genetic engineering.	**K1**
CO2	Learn the types and application of cloning vectors.	**K2**
CO3	Study and analyse different types of gene transfer methods.	**K3**
CO4	Design protocol for plant tissue culture.	**K4**
CO5	Compile the principles and application of Intellectual Property Rights.	**K5**

Relationship Matrix											
Semester	**Course Code**				**Title of the Course**					**Hours**	**Credits**
6	**25UBO63CC12**				**Core Course - 12:** Genetic Engineering and Biotechnology					**6**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63CP07	**Core Practical - 7:** Plant Physiology	3	1

Detailed Study:

1. Effect of temperature on membrane permeability.
2. Osmosis – Thistle funnel, potato osmoscope.
3. Determination of water potential and solute potential.
4. Determination of root pressure and sap exudation.
5. Effect of environmental factors on the rate of transpiration.
6. Extraction and separation of leaf pigments.
7. Effect of light and CO2 on photosynthesis.
8. Aerobic respiration – Ganong's respiroscope.
9. Ascent of sap – Balsam plant experiment.
10. Measurement of lipase activity.
11. Demonstration experiments:
    - i. Phototropism,
    - ii. Geotropism,
    - iii. Arc Auxanometer,
    - iv. Dialatometer
    - v. Hydroponics

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63CP08	**Core Practical - 8:** Genetic Engineering, Biotechnology and Biochemistry	3	1

Genetic Engineering and Biotechnology

1. Sterilization techniques
2. Culture media Preparation
3. *In vitro* Seed germination
4. Embryo culture
5. Callus induction and differentiation
6. Micropropagation
7. Synthetic Seeds
8. Hardening methods
9. Demonstration of PAGE
10. Demonstration AGE

Biochemistry

1. Estimation of total free amino acids (Troll and Canon's method)
2. Qualitative test for carbohydrates (Sugar)
3. Peroxidase activity
4. Estimation of cellulose
5. Volumetric estimation of ascorbic acid

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63ES03A	**Discipline Specific Elective - 3:** Biochemistry	4	3

Course Objectives
To understand the Structural and Functional Aspects of Biomolecules
To Explore the Biochemical Basis of Metabolic Pathways
To Comprehend the Role of Enzymes in Metabolism
To analyse the Importance of Secondary Metabolites in Plants
To apply Knowledge of Biomolecules to Biotechnology and Research

Unit I: Carbohydrates (12 Hours)

Classification of carbohydrates. Stereochemistry of simple sugars; α, β-glycosidic linkages. Structure and properties of monosaccharides (glucose, fructose, mannose), disaccharides (maltose, lactose, sucrose) and oligosaccharides. Polysaccharides: Chemical structure and functions of starch, glycogen, cellulose and peptidoglycan.

Unit II: Lipids (12 Hours)

Classification, structure, properties and biosynthesis of lipids. Saturated and unsaturated fatty acids. Structure and function of phospholipids, glycolipids and cholesterol. Biological importance of lipids.

Unit III: Amino Acids and Proteins (12 Hours)

Amino acids: Structure, properties, and classification. Non-protein amino acids and their functions. Protein classification. Peptide bond formation and structure of proteins: Primary, secondary, tertiary and quaternary structures. Forces stabilizing protein structure.

Unit IV: Enzymes (12 Hours)

Biocatalysts: Definition and characteristics. IUB classification of enzymes. Principles of catalysis, activation energy, transition state and active site. Enzyme kinetics, mode of enzyme action: Lock & Key and Induced Fit models. Factors affecting enzyme activity, Enzyme regulation: Competitive, non-competitive and feedback inhibition.

Unit V: Secondary Metabolites (12 Hours)

Functions of secondary metabolites in plants. Terpenoids: Classification and significance. Nitrogen-containing metabolites (alkaloids): Structure, properties and biological roles. Phenolics: Classification, properties and significance. Shikimic acid and mevalonic acid pathways. Synthesis of alkaloids from amino acids.

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

Books for Study:

1. Lubert, S. (2005). *Biochemistry*. W. H. Freeman & Co.
2. Lehninger. (2008). *Principles of Biochemistry by Nelson*, (5thEd.). D. L., Lehninger, A. L., & Cox, M. M. Publisher: W. H. Freeman and Company.
3. Judith, G. V. (2011). *Biochemistry by Donald Voet*, (4thEd.). Publisher: John Wiley& Sons.

Books for Reference:

1. Caret.*etal*. (1993). *Inorganic, Organic and Biological Chemistry.* WMC Brown.
2. Jeremy, M. B., John, L. T., & Lubert, S. (2010). *Biochemistry*, (17thEd.).74 Publisher: W. H. Freeman.

Websites and eLearning Sources:

1. https://www.medicalnewstoday.com/articles/161547#chemistry
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2642958/
3. https://bio.libretexts.org/Bookshelves/Biochemistry/Fundamentals_of_Biochemistry_(Jakubowski_and_Flatt)/01%3A_Unit_I

4. _Structure_and_Catalysis/03%3A_Amino_Acids_Peptides_and_Proteins/3.01%3A_Amino_Acids_and_Peptides
5. https://infinitabiotech.com/blog/principles-of-enzyme-catalysis/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Explain the structure	**K1**
CO2	Describe the mechanisms of enzyme action	**K2**
CO3	Analyse the role of lipids and proteins in membrane structure and function	**K3**
CO4	Identify and explain the synthesis and functions of secondary metabolites in plants	**K4**
CO5	Apply biochemical principles in biotechnology	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UBO63ES03A**			**Discipline Specific Elective - 3:** Biochemistry						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63ES03B	**Discipline Specific Elective - 3:** Agricultural Botany	4	3

Course Objectives
To understand the Fundamentals of Agriculture including its impact on the Indian economy.
To analyse Agricultural development from ancient practices to modern scientific approaches.
To classify various crops, understand soil types and analyse factors influencing crop production.
To apply agricultural Practices and soil fertility techniques.
To implement Post-Harvest and Sustainable Practices like organic farming, precision agriculture, and climate-resilient farming.

UNIT I: Introduction to Agriculture (12 Hours)

Definition, importance, and scope of agriculture. Branches of agriculture with emphasis on agronomy. National and international agricultural research institutes (ICAR, IARI, IRRI, CIMMYT). Role of agriculture in the Indian economy – Contribution to GDP and national income.

UNIT II: History and Development of Agriculture (12 Hours)

Evolution of human civilization and the role of agriculture. Importance of the Neolithic Revolution in agricultural history. Agricultural development in India and globally. Agriculture in ancient India – Traditional farming practices and innovations. Chronology of scientific agricultural advancements in India – Green Revolution, White Revolution, and contemporary agro-technologies.

UNIT III: Crop Classification and Crop Production (12 Hours)

Classification of crops based on season, use, and economic importance. Major crops of India and Tamil Nadu – Cereals, pulses, oilseeds, fibers, and commercial crops. Major soil types in India and Tamil Nadu – Soil health and fertility management. Factors affecting crop production – Climate, soil, biotic, physiographic, and socioeconomic factors. Agricultural seasons in India and Tamil Nadu – Kharif, Rabi, and Zaid crops. Tillage – Definition, objectives, types, and modern tillage techniques.

UNIT IV: Basic Agricultural Practices (12 Hours)

Seed treatment – Methods and significance. Nursery management and different sowing techniques. Germination – Factors affecting germination and seedling establishment. Crop spacing and population density – Impact on yield and growth. After-cultivation practices – Thinning, gap filling, and intercultural operations. Weed management – Classification of weeds, beneficial and harmful effects, weed control measures. Irrigation – Importance, types of irrigation, and water-use efficiency. Manures and fertilizers – Classification, methods of application, and integrated nutrient management.

UNIT V: Harvesting, Post-Harvest Management, and Emerging Trends (12 Hours)

Maturity indices and harvesting techniques of field crops. Post-harvest handling – Cleaning, drying, grading, and packaging. Storage methods – Traditional and modern storage techniques, pest and disease management in stored grains. Recent developments in agriculture – Precision farming, organic farming, sustainable agriculture, and climate-resilient farming practices. Government initiatives and policies for agricultural development in India.

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

Books for Study:

1. Rao, S. G. B., Thiruppathi, M., Kumar, R., & Kumar, S. M. P. (2015). *Basic Agronomy*. Manibharathi Publications.
2. Chandrasekaran, B., Annadurai, K., & Somasundaram, E. (2010). *A Text book of Agronomy*. New Age International Publishers.

Books for Reference:

1. Balasubramaniyan, P. & S P. Palaniappan. (2010). *Principles and Practices of Agronomy*. Agrobios.

2. ICAR. (2011). *Handbook of Agriculture*. Indian Council of Agricultural Research.
3. Panda, S. C. (2010). *Agronomy*. Agrobios (India).
4. Reddy, Y. T. & Reddi, S.G. H. (2010). *Principles of Agronomy*. Kalyani Publishers.

Websites and eLearning Sources:

1. http://www.dphu.org/uploads/attachements/books/books_2248_0.pdf
2. https://www.scribd.com/doc/119183030/principles-of-agronomy-andagrometerology
3. http://www.newagepublishers.com/samplechapter/001757.pdf
4. http://www.sun.worldcat.org/title/principlesofagronomy/oclc/689265

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Comprehend Agricultural Importance: Demonstrate knowledge of the role of agriculture in economic and environmental sustainability.	**K1**
CO2	Evaluate Agricultural Advancements: Analyze historical developments in agriculture and their impact on current practices.	**K2**
CO3	Demonstrate Crop and Soil Management Skills: Apply knowledge of crop classification, soil fertility, and production techniques to improve yield.	**K3**
CO4	Apply Best Farming Practices: Implement appropriate agricultural techniques, including sowing, irrigation, weed control, and fertilizer application.	**K4**
CO5	Utilize Post-Harvest and Modern Agricultural Technologies: Assess storage methods, pest control in storage, and integrate innovative agricultural trends like smart farming and organic cultivation.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UBO63ES03B**			**Discipline Specific Elective - 3:** Agricultural Botany						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63ES04A	**Discipline Specific Elective - 4:** Bio-entrepreneurship	4	3

Course Objectives
To introduce the scope and significance of bio-entrepreneurship in various biotech industries.
To develop business planning and market analysis skills for biotech startups.
To explore entrepreneurial opportunities and regulatory frameworks in the faunal sector.
To understand innovations in bioproducts and their market potential.
To familiarize students with funding opportunities and intellectual property rights in biotechnology.

UNIT-I **(12 Hours)**

Introduction of Bio entrepreneurship: Scope, Importance and Bio entrepreneurs in the biotech industry, Types of bio-based industries: Pharmaceuticals, Agriculture, Healthcare, Environmental, Emerging trends in the bio economy, Ethical, legal, and social implications of biotechnology businesses.

Unit II **(12 Hours)**

Bio Business Planning & Market Analysis: Biotech Start-ups in India, Identifying target customers and market segmentation, SWOT analysis of biotech businesses, Competitor analysis, Risk assessment and mitigation strategies, Patent laws and intellectual property rights (IPR).

Unit III **(12 Hours)**

Entrepreneurial opportunities, Regulatory in faunal sector: Sustainable aquaculture and fisheries, Eco-friendly pest management and biological control, Wildlife photography and documentation business, Pet industry and veterinary services, Wildlife Protection Act and biodiversity laws, Animal ethics, licensing, and permits.

Unit-IV **(12 Hours)**

Bio products and Innovations: Gene therapy products, 3D bio printing, Sericulture and Apiculture Products: Silk, honey, and royal jelly, Bioactive compounds from marine organisms, Designing new biological parts (Synthetic Biology), Polymers derived from cornstarch (Bio plastic).

Unit-V **(12 Hours)**

Funding openings in Biotech start-ups: Government funding (DBT, NABARD, DST,) NGOs and international conservation fund agencies (WWF, IUCN, UNEP), Loans for organic farming start-ups, Private investors and crowd funding for bio-businesses development. Intellectual Property Rights in Biotech products.

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

Books for Study:

1. Arvind Kumar Bhatt, Ravi Kant Bhatia, and Tek Chand Bhalla (2020) Basic Biotechniques for Bioprocess and Bio-entrepreneurship, Elsevier Science & Technology, Amsterdam, Netherlands.
2. Dr. N. Yogananth, Dr. Sheeba E, Dr. T. Sivakumar, and Dr. R. Bhakyaraj **(**2022) *Bioentrepreneurship in Biosciences-Recent Approaches,* Darshan Publishers, Tamil Nadu, India.
3. Shreya Sanghvi Malik and Shiv Kant Shukla (2020) *Bioentrepreneurship Development: A Resource Book,* Biotech Consortium India Limited (BCIL), New Delhi, India

Books for Reference:

1. Swati Agarwal, Sonu Kumari, and Suphiya Khan (2021*) Bioentrepreneurship and Transferring Technology into Product Development,* Business Science Reference, Hershey, Pennsylvania, USA.
2. Madhura N. Hegde, Jayapadmini Kanchan, Ganaraj K., Asha B. Shetty, and Rajatha (2021) *Bioentrepreneurship Globally*, IGI Global, Hershey, Pennsylvania, USA
3. Jyoti Gogte (2024) *Roadmap for an Entrepreneur*, Vishwakarma Publications, Pune, India.

Websites and eLearning Sources:

1. https://www.cbehx.co.uk/product/bioentrepreneurship/
2. https://ep.jhu.edu/courses/585761-bioentrepreneurship/
3. https://www.bizmove.com/start-business/biotech.htm
4. https://businessplan-templates.com/blogs/write-plan/biotech-startup-consulting

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Apply knowledge of biotechnology and entrepreneurship principles to solve complex problems	**K1**
CO2	Develop critical thinking and analytical skills for effective decision-making in bio-business contexts.	**K2**
CO3	Demonstrate effective communication and leadership abilities in multidisciplinary teams.	**K3**
CO4	Understand and commit to ethical, legal, and social responsibilities in biotechnology enterprises.	**K4**
CO5	Engage in lifelong learning to adapt to evolving bio-industrial landscapes.	**K5**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**							**Hours**		**Credits**
6	**25UBO63ES04A**	**Discipline Specific Elective - 4:** Bio-entrepreneurship							**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	2	2	2	2	2	3	2	2.3
CO2	2	3	2	1	2	2	3	2	2	3	2.2
CO3	2	2	3	2	1	2	3	2	2	2	2.1
CO4	1	2	2	2	2	2	3	2	3	2	2.2
CO5	1	2	2	3	2	2	3	2	1	3	2.1
										Mean Overall Score	**2.18 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63ES04B	**Discipline Specific Elective - 4:** Biological Techniques	4	3

Course Objectives
To learn the micro technique preparation of slides
To understand the stain preparation and staining techniques
To study about the specimen preservation techniques
To understand about the organic farming development techniques
To know about the various clinical and immunological tests

UNIT-I **(12 Hours)**

Micro techniques-selection of material, fixation, fixation images-acid and basic. Preparation of permanent slide-Dehydration process, Infiltration of wax, embedding, sectioning (microtome), mounting. Clearing, smear and squash techniques.

UNIT-II **(12 Hours)**

Stains: Classification single, double, triple staining. Florescent image processing Nuclear, cytoplasmic, cell wall stains and the irrational. Herbarium-collection, drying, pasting of plant specimen, Protection of Herbarium-importance.

UNIT-III **(12 Hours)**

Types of museum specimens: Dry and wet specimens, taxidermy, skeletons, Dry Animal preservation: (Stuffing, freeze-drying, and plastination), Wet animal preservation: Fixatives and preservatives (Formalin, Alcohol, Glycerin), Bone bleaching and degreasing methods, Labeling, tagging, and record-keeping in museum collections, Mounting and long-term preservation of skeletal specimens.

UNIT-IV **(12 Hours)**

Earthworm and its types, Preparatory methods of vermiculture techniques. Vermin compost-panchakavia; fish extract, Economic and ecological importance of vermicompost. Biofertilizers-Cultivation of Spirulina and Scenedesmus. Animal rearing: albino rats, rabbits and fruit fly.

UNIT-V **(12 Hours)**

Nucleic acid extraction (DNA & RNA), Types of PCR, Protein sequences techniques-SDS Page, Western blotting, Animal cell culture: Preparation and techniques, DNA finger Printing, Monoclonal antibodies, Immunohistochemistry.

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

Books for Study:

1. Yadav, P. R. (2006). *Biological Techniques*. Discovery Publishing House.
2. Swargiary, A. (2017). *Biological Tools & Techniques*. Kalyani Publishers.

Books for Reference:

1. Ramakrishnan, S. (2012). *Manual of Medical Laboratory Techniques*. Jaypee Brothers Medical Publishers.

Websites and eLearning Sources:

1. https://nios.ac.in/media/documents/dmlt/HC/Lesson-20.pdf
2. https://www.sciencedirect.com/science/article/pii/S2405580819303449
3. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/med_lab_tech_students/serology.pdf
4. https://www.ndvsu.org/images/StudyMaterials/Micro/Stains---staining.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Understand the various micro techniques in biology.	**K1**
CO2	Learn the principles and applications of microscopy.	**K2**
CO3	Construct immunological techniques and applications.	**K3**
CO4	Distinguish and identify techniques used to preserve organisms in museum.	**K4**
CO5	Prepare biofertilizers and animal rearing.	**K5**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UBO63ES04B**			**Discipline Specific Elective - 4:** Biological Techniques						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	2	2	3	2	1	2	**2.1**
CO2	2	3	2	2	3	2	3	2	2	1	**2.2**
CO3	2	2	3	2	1	2	2	3	2	2	**2.1**
CO4	1	2	2	3	2	1	3	2	3	2	**2.1**
CO5	1	2	2	3	2	2	3	2	2	3	**2.2**
										Mean Overall Score	**2.1 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO63CE01	Comprehensive Examination	-	2

Course Objectives
To assess the student's knowledge of the area of specialization.
To evaluate the ability of a student to formulate an original research problem.
To Comprehensiveness and relevance.
To present the knowledge, skills and practical they undertake.
To show their deep understanding of concepts related to their field of study.

UNIT I

Classification, structure and reproduction of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms, Plant diseases and defense mechanism. Ecology and Evolutionary trends. Bionomial nomenclature, Numerical Taxonomy and Chemotaxonomy, Tissues, totipotency, properties of wood; Microsopogenesis, megasporogenesis, double fertilization and polyembryony.

UNIT II

Cell Biology - Cell as a unit structure and function, Cell division: Mitosis and Meiosis Chromosomal behaviour and their cytological significance; Mendelian Genetics- linkage and crossing over, Chromosome mapping, Human genome project; Protein synthesis and gene expression, DNA replication; Polyploidy and mutations in crop improvement. Heterosis and Inbreeding Depression; theories of evolution and variations in speciation.

UNIT III

Photosynthesis: mechanism and importance, Nitrogen Metabolism. Physiology of seed dormancy and germination, Plant growth Regulator, Phytochrome and its role. Biopolymers- carbohydrates, proteins and lipids; Enzyme kinetics and Mode of enzyme action. Secondary metabolites- Alakaloids, phenolics and terpenoids. Bioenergetics, redox potential and coupled reaction, photobiology.

UNIT IV

Whittaker's five kingdom concept, food spoilage and preservation, Role of microbes in waste water treatment, Biofertilizer, protoplast culture, Somatic hybrid and Cybrids. Synthetic seeds and their application, Vectors in gene cloning - Plasmids, Cosmids, Bacteriophages, fermentation as a biochemical process, Microbial Single Cell Protein (SCP) production, humoral and cellular immunity, Antibody types and immunological role.

UNIT V

Sampling techniques, Central values (mean, mode, median), T-test, Chi square Test; Concept of Ecosystem, Method of studying plant communities, Vegetation types of India, Biotic interactions - Succession and its types, Biogeochemical cycles. Ethnobotany- scope and Tribes of Tamil Nadu, Conservation - in situ and ex situ conservation.

Course Outcomes		
CO No.	CO-Statements On successful completion of this course, the students will be able to	Cognitive Levels (K-Level)
CO1	Engage theory in light of a given topic, issue, or problem and vice-versa.	K1
CO2	Substantive knowledge of theories, concepts, and methodologies.	K2
CO3	Demonstrate the Intellectual maturity in study area.	K3
CO4	Maximize their time and performance.	K4
CO5	Think critically and the ability to articulate reflective and knowledgeable responses to challenging questions.	K5

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
6	**25UBO63CE01**			Comprehensive Examination						**-**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
Mean Overall Score											**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
6	25UBO64OE02	**Open Elective - 2:** Landscape Designing and Waste Management	4	2

Course Objectives
To know about the brief history, divisions, classification and structure of horticultural plants.
To develop practical skills in micro propagation techniques.
To apply indoor and outdoor gardening and the techniques of flower decoration.
To know the importance of vermin composting in agricultural practices.
To apply knowledge about the animal and human relationship

UNIT-I **(12 Hours)**

Importance of scope of horticulture - Divisions of horticulture, famous gardens in world & India; Horticultural Crops - Conservation and Management. Post harvest Management of Horticultural Crops. Lawn making and maintenance, water garden, glass house, rockery, hanging baskets. Layout a model of Landscape design.

UNIT-II **(12 Hours)**

Nursery: Preparation of Nursery beds. Xeriscaping. Vegetative Propagation: Cutting, Layering, Grafting and Budding. Steps and Methods involved in Transplantation. Bonsai, Terrarium and Topiary techniques. Floriculture: Dry and wet flower decoration.

UNIT-III **(12 Hours)**

Gardening; Designing outdoor garden-hedges, edges, fences, terrace garden, fruit garden, Vegetable garden: Tomato, brinjal, and snake guard, Fruit crops: Induction of flowering, flower thinning and fruit setting. Medicinal plant garden. Layout model of outdoor college garden. Designing of Indoor kitchen garden. Field Visit; Horticultural Department.

UNIT-IV **(12 Hours)**

Definition-scope and importance of solid waste management-Types of solid wastes and transport and processing, Vermicomposting-Earthworm and its characteristics-Internal anatomy-digestive, excretory. Preparatory methods of vermicompost and vermiwash Economic importance of vermicompost, panchakavya, fish amino acids.

UNIT-V **(12 Hours)**

Role of microorganisms, insects, and invertebrates in waste degradation, animals in cleaning up waste, Disease transmission from waste dumps to humans and animals (Zoonotic diseases), Animal-based bioplastics and biodegradable materials. Policies and regulations on waste management.

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

Books for Study:

1. Bose, TK., Maiti, RG., Dhua, RS and Das, P. (1999). Floriculture and Landscaping. Naya Prokash, Calcutta. Books for Reference.
2. Ashman, M. A. and Puri, G. (2002). Essential soil science-A clear and concise introduction to soil science. Blackwell scientific publishers, London.
3. Subba Rao, N. S. (1997). Biofertilizers in Agriculture and Forestry. India Book House Limited, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.

Books for Reference:

1. Ashman, M. A. and Puri, G. (2002). Essential soil science- A clear and concise introduction to soil science. Blackwell scientific publishers, London.
2. SubbaRao, N. S. (1997). Biofertilizers in Agriculture and Forestry. India Book House Limited, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
3. Tolanus, S. (2006). Soil fertility, Fertilizer and Integrated Nutrient management. International Book Distributory Co.

4. Techobanoglous, T.E. (1997). Solid Waste Engineering Principles and Management. McGraw-Hill.
5. (2000). Manual on Municipal 1 Solid waste Management. CPHEEO. Ministry of Urban Development. Govt. Of. India.

Websites and eLearning Sources:

1. https://www.dec.ny.gov/chemical/8480.html
2. https://www.fao.org/3/y5104e/y5104e05.htm
3. https://www.gasum.com/en/our-operations/biogas-production/how-is-biogas-produced/
4. https://www.legit.ng/1128248-economic-importance-earthworm-vermiculture.html

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Know about the brief history, divisions, classification and structure of horticultural plants	**K1**
CO2	Apply techniques of nursery and the importance of Floriculture	**K2**
CO3	Acquire knowledge on various fields of gardening	**K3**
CO4	Develop technology of vermicomposting and their applications	**K4**
CO5	Perform various methods of composting	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
6	**25UBO64OE02**		**Open Elective - 2:** Landscape Designing and Waste Management						**4**		**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	2	2	3	2	2	2	**2.3**
CO2	2	3	2	2	3	2	3	2	2	1	**2.2**
CO3	2	2	3	2	2	3	2	3	2	2	**2.3**
CO4	1	3	2	3	2	1	3	2	3	2	**2.2**
CO5	1	2	2	3	2	3	3	2	2	3	**2.3**
										Mean Overall Score	**2.3 (High)**