ST. MARY'S COLLEGE (Autonomous)

(Re-accredited with 'A^{+}' Grade by NAAC)

Thoothukudi-628001, Tamil Nadu

(Affiliated to Manonmaniam Sundaranar University)

B.Sc. Botany

School of Biological Sciences

Outcome Based Curriculum

(W.e.f.2023)

Preamble

The Department of Botany offers an enriched learning environment in Plant Sciences. The Botany programme provides basic training in Plant Biology, Ecology, Physiology, Marine Botany, Mycology. Plant Diseases and Biotechnology. The Department has excellent laboratory and research facilities to augment research in the fields of botany. Besides, students develop transferable skills, critical and lateral thinking, analytic and interpretive skills and communicating skills. It has great scope for higher education in diverse branches of botany. The programme opens avenues for multiple job opportunities as Soil and Plant Scientist, Biophysicist, Biochemist, Biological Technician, Environmental Scientist, Mycologist, Plant Breeders, Horticulturist and Entrepreneur in plant products and herbal medicine.

Vision : Developing academically, professionally and ethically empowered human resources

Mission : To provide an academic ambience that strengthens critical thinking, scientific inquiry and problem solving in the frontier areas of plant biology

Programme Outcome

PO No.	After completion of the Undergraduate programme the students of St. Mary's College will be able to
PO 1	acquire an in-depth domain knowledge and a comprehensive knowledge of various disciplines to become skilled professionals
PO 2	enrich their communicative skills, and enhance their creative, numerical, analytical and problem solving skills
PO 3	gain potential skills to excel in digital literacy, team management, scientific reasoning, research and self-directed life-long learning to emerge as entrepreneurs
PO 4	be aware of the environment with a social responsibility for the well-being of humanity and the planet at large
PO 5	be an empowered, economically independent woman with a global perspective to emerge holistically in the egalitarian society

Programme Specific Outcome

PSO No.	Students of B.Sc. Botany will be able to	PO Matched
PSO-1	acquire a comprehensive understanding of diverse plant life by delving into their economic importance, life cycles, classification, morphology, anatomy, physiological functions, embryological processes, genetics and ecological contributions.	**PO1**
PSO-2	demonstrate essential skills in the identification of plants, cultivation practices, applicationof basic microbial techniques, proficiency with diverse instruments, understanding environmental laws and adeptness in clear and effective scientific communication	**PO2**
PSO-3	perform experiments in both field and laboratory contexts, utilizing analytical skills, interpretive abilities and effective writing to analyze and communicate research outcomes.	**PO3**
PSO-4	comprehend the interconnections between various branches of botany and other scientific disciplines. practice and demonstrate the techniques that ensure skill development and job option.	**PO3, PO4**
PSO-5	cultivate an awareness of the natural world and adopt a sense of social responsibility, applying acquired knowledge to contribute actively to environmental conservation as responsible citizens.	**PO5**

ST. MARY'S COLLEGE (AUTONOMOUS), THOOTHUKUDI.
DEPARTMENT OF BOTANY
UG COURSE STRUCTURE (w. e. f. 2023)

SEMESTER I

Part	Components	Course Code	Course Title	Contact Hours / Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA11 23ULFA11	இக்கால இலக்கியம் : (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, சிறுகதை) Foundation Course French I	6	3	25	75	100
II	General English	23UGEN11	Poetry, Prose, Extensive Reading and Communicative English I	6	3	25	75	100
III	Core **I**	23UBOC11	Plant Diversity I – Algae	5	5	25	75	100
	Core Practical I	23UBOCR1	Algae Practical	3	3	40	60	100
	Generic Elective **I**	23UZOE11	Diversity of Invertebrates and Chordates	4	4	25	75	100
	Generic Elective Practical I	23UZOER1	Diversity of Invertebrates and Chordates Practical	2	1	40	60	100
IV	Skill Enhancement Course I (Discipline Specific)	23UBOSE1	Organic farming	2	2	20	30	50
	Foundation Course	23UBOF11	Basics of Botany	2	2	20	30	50
			Total	**30**	**23**			

Semester II

Part	Components	Course Code	Course Title	Contact Hours / Week	Credits	Max Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA21 23ULFA21	சமய இலக்கியங்கள் : (செய்யுள், இலக்கணம், இலக்கிய வரலாறு) Foundation Course: French II	6	3	25	75	100
II	General English	23UGEN21	Poetry, Prose, Extensive Reading, and Communicative English II	6	3	25	75	100
III	Core **II**	23UBOC21	Plant DiversityII – Fungi, Bacteria, Viruses, Plant Pathology and Lichens	5	5	25	75	100
	Core Practical **II**	23UBOCR2	Fungi, Bacteria, Viruses, Plant Pathology and Lichens Practical	3	3	40	60	100
	Generic Elective **II**	23UZOE21	Physiology, Developmental Zoology, Immunology and Genetics	4	4	25	75	100
	Generic Elective Practical **II**	23UZOER2	Physiology, Developmental Zoology, Immunology and Genetics Practical	2	1	40	60	100
IV	Skill Enhancement Course **II** (Discipline Specific)	23UBOSE2	Mushroom Cultivation	2	2	20	30	50
	Skill Enhancement Course **III** (Discipline Specific)	23UBOSE3	Herbal Medicine	2	2	20	30	50
			Total	**30**	**23**			

SEMESTER III

Part	Components	Course Code	Course Title	Hrs / Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil	23ULTA31	காப்பிய இலக்கியங்கள் : செய்யுள், இலக்கணம், இலக்கிய வரலாறு, புதினம்	6	3	25	75	100
	French	23ULFA31	French Literature and Grammar I					
II	General English	23UGEN31	English Poetry, Prose, Extensive Reading and Communicative English – III	6	3	25	75	100
III	Core **III**	23UBOC31	Bryophytes, Pteridophytes and Gymnosperms	5	5	25	75	100
	Core Practical **III**	23UBOCR3	Bryophytes, Pteridophytes and Gymnosperms Practical	2	2	40	60	100
	Generic Elective **III**	23UCHE32	Chemistry for Biological Sciences I	4	3	25	75	100
	Generic Elective Practical **III**	23UCHER1	Chemistry Practical I	2	1	40	60	100
	NME **I**	23UBON31	Herbal Health Care Products	2	2	20	30	50
IV	Skill Enhancement Course **IV** (Discipline Specific)	23UBOSE4	Plant Propagation Techniques Practical	2	2	20	30	50
	Ability Enhancement Course **I**	23UAYM31	Yoga and Meditation	1	1	20	30	50
	Self-Study **I** / MOOC / Internship (Compulsory)	23UBOSS1	Food Processing Technology		+2		50	50
Total				**30**	**22+2**			

SEMESTER IV

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil	23ULTA41	சங்க இலக்கியங்கள் : செய்யுள், இலக்கணம், இலக்கிய வரலாறு, நாடகம்	6	3	25	75	100
	French	23ULFA41	French Literature and Grammar II					
II	General English	23UGEN41	English Poetry, Prose, Extensive Reading and Communicative English IV	6	3	25	75	100
III	Core **IV**	23UBOC41	Anatomy and Embryology	5	5	25	75	100
	Core Practical **IV**	23UBOCR4	Anatomy and Embryology Practical	2	2	40	60	100
	Generic Elective **IV**	23UCHE42	Chemistry for Biological Sciences II	4	3	25	75	100
	Generic Elective Practical **IV**	23UCHER2	Chemistry Practical II	2	1	40	60	100
	NME **II**	23UBON41	Horticulture	2	2	20	30	50
IV	Skill Enhancement Course **V** (Discipline Specific)	23UBOSE5	Biological Techniques Practical	2	2	20	30	50
	Ability Enhancement Course **II (Entrepreneurial Based)**	23UABO41	Value Added Products from Plants	1	1	20	30	50
V	NCC / NSS / Sports				1			
	CDP Extension Activity				+1			
			Total	**30**	**23 + 1**			

Note : Ability Enhancement course 23UABO41
Evaluation 20 : 30 will be done only by the department.
Internal and External examinations will be in the form of Practical / Presentation of models / Reports.

SEMESTER V

Part	Components	CourseCode	Course Title	Hrs / Week	Credits	Max. Marks		
						CIA	ESE	Total
III	Core **V**	23UBOC51	Taxonomy of Angiosperms	4	4	25	75	100
	Core **VI**	23UBOC52	Plant Physiology	4	4	25	75	100
	Core **VII**	23UBOC53	Phytochemistry	4	4	25	75	100
	Core **VIII**	23UBOC54	Cell Biology and Genetics	4	4	25	75	100
	Core Practical **V**	23UBOCR5	Taxonomy of Angiosperms and Plant Physiology Practical	4	2	40	60	100
	Core Practical **VI**	23UBOCR6	Phytochemistry, Cell Biology and Genetics Practical	4	2	40	60	100
	Discipline Specific Elective **I**	23UBOE51 23UBOE52	**Molecular Biology** OR Ethnobotany	4	4	25	75	100
IV	Ability Enhancement Course **III**	23UAEV51	Environmental Studies	2	1	20	30	50
	Self-Study **II** / MOOC / Internship (Optional)	23UBOSS2	Botany for Competitive Examination		+2		50	50
Total				**30**	**25+2**			

Semester VI

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
III	Core **IX**	23UBOC61	Biochemistry	4	4	25	75	100
	Core **X**	23UBOC62	Marine Biology	4	4	25	75	100
	Core **XI**	23UBOC63	Ecology and Phytogeography	4	4	25	75	100
	Core Practical **VII**	23UBOCR7	Biochemistry Practical	2	1	40	60	100
	Core Practical **VIII**	23UBOCR8	Marine Biology, Ecology and Phytogeography Practical	4	2	40	60	100
	Core **XII (**Project)	23UBOP61	Project and Viva Voce	6	4	40	60	100
	Discipline Specific Elective **II**	23UBOE61 23UBOE62	**Biotechnology** OR Entrepreneurial Botany	4	3	25	75	100
IV	Skill Enhancement Course **VI** (Discipline Specific)	23UBOSE6	Basics of Bioinformatics	2	2	20	30	50
				30	**24**			

Semester	Hours	Credits	Extra Credits
I	30	23	--
II	30	23	--
III	30	22	2
IV	30	23	1
V	30	25	2
VI	30	24	--
Total	180	140	5

Courses	Number of Courses	Hours / week	Credits	Extra Credits
Tamil / French	4	24	12	--
English	4	24	12	--
Core Theory	11	48	48	--
Core Practical	8	24	17	
Generic Elective Theory	4	16	14	--
Generic Elective Practical	4	8	4	--
Discipline Specific Elective	2	8	7	--
Group Project	1	6	4	--
Skill Enhancement Course	6	12	12	--
Ability Enhancement Course	3	4	3	--
Foundation Course	1	2	2	--
NME	2	4	4	--
Extension Activities (CDP)				+1
NCC, NSS & Sports		--	1	
Self Study Papers (Optional)	1	--	--	+2
Self Study Papers (Compulsory)	1	--	--	+2
Total		**180**	**140**	**5**

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம் செய்யுள், இலக்கணம், இலக்கிய வரலாறு, சிறுகதை			
23ULTA11	**Hrs/Week:6**	**Hrs/Semester: 90**	**Credits: 4**

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	காலந்தோறும் வளர்ந்துவரும் தமிழ்க் கவிதைகளின் வடிவினையும், கருத்தோட்டத்தினையும் மாணவியர் அறிந்துகொள்வர்.
2	தமிழ் மொழியைப் பிழையின்றி எழுதவும் பேசவும் முடியும்.
3	படைப்பாற்றலை வளர்த்துக் கொள்வர்.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர். துறைதோறும் தமிழ் மொழியின் வளர்ச்சியை அறிவர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	**இப்பாடத்திட்டம் - மாணவியரிடம்**	**அறிவாற்றல் திறன்**
CO-1	பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல்	K1
CO-2	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல்	K3
CO-4	இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுவர். தமிழ் மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்ளுதல்	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	K5

அலகு - 1

மரபுக் கவிதை **(18 மணி நேரம்)**

1. தமிழ்த் தெய்வ வணக்கம் - பெ.சுந்தரனார்
2. பெண்கள் விடுதலைக் கும்மி - பாரதியார்
3. சிறுத்தையே வெளியே வா - பாரதிதாசன்
4. புத்தரும் சிறுவனும் - கவிமணி
5. ஆதிமந்தி புலம்பல் - கண்ணதாசன்
6. துறைமுகம் - சுரதா
7. கடல் - தமிழ் ஒளி

அலகு - 2

புதுக்கவிதை **(18 மணி நேரம்)**

1. வீட்டுக்கொரு மரம் வளர்ப்போம் - அப்துல் ரகுமான்
2. சென்ரியூ கவிதைகள் - ஈரோடு தமிழன்பன்
3. பிற்சேர்க்கை - வைரமுத்து
4. வாழைமரம் - மு.மேத்தா
5. வள்ளுவம் பத்து - அறிவுமதி
6. ஆனந்த யாழை மீட்டுகிறாய் - நா. முத்துக்குமார்
7. சபிக்கப்பட்ட முத்தம் - சுகிர்த ராணி
8. நீ எழுத மறுக்கும் எனது அழகு - இளம்பிறை

அலகு – 3

சிறுகதை **(18 மணி நேரம்)**

1. வாய்ச் சொற்கள் - ஜெயகாந்தன்
2. கடிதம் - புதுமைப்பித்தன்
3. கரு - உமாமகேஸ்வரி
4. முள்முடி - தி.ஜானகிராமன்
5. சிதறல்கள் - விழி.பா.இதயவேந்தன்
6. வீட்டின் மூலையில் சமையல் அறை - அம்பை
7. ராசப்பா - முனைவர் மி.சு.எழிலரசி
8. ஆண்டன் செக்காவ் - நாய்க்காரச் சீமாட்டி (மொழிபெயர்ப்புக் கதை)

அலகு - 4

இலக்கிய வரலாறு **(18 மணி நேரம்)**

1. 20 –ஆம் நூற்றாண்டு கவிஞர் பெருமக்கள்
2. கவிதையின் வகையும் வளர்ச்சியும்
3. தமிழ்ச் சிறுகதையின் தோற்றமும் வளர்ச்சியும்
4. மொழிபெயர்ப்புகள் தோற்றமும் வளர்ச்சியும்

அலகு - 5

மொழித்திறன் **(18 மணி நேரம்)**

1. பொருள் பொதிந்த சொற்றொடர் அமைத்தல்
2. ஓர் எழுத்து ஒரு மொழி
3. வேற்றுமை உருபுகள்
4. திணை, பால், எண், இடம்
5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு

துணைநின்ற நூல்கள்

1. பாரதியார் படைப்புகள் - சீனி.விசுவநாதன் (பதிப்பாசிரியர்)
அலயன்ஸ் கம்பெனி
64, ராம கிருஷ்ணா சாலை
மயிலாப்பூர்
சென்னை -4.

2. பாரதிதாசன் கவிதைகள் - பேரா. இ. சுந்தரமூர்த்தி
142, ஜானி ஜான் கான் சாலை,
இராயப்பேட்டை, சென்னை – 17

3. வைரமுத்து கவிதைகள் - வைரமுத்து
திருமகள் நிலையம்
55, வெங்கட்நாராயணா சாலை
தி.நகர் சென்னை – 17.

4. ரகசியப்பூ - அப்துல் ரகுமான்
நேஷனல் பப்ளிகேஷன்
2, தியாகராய நகர்
சென்னை – 17

5. நன்னூல் - பவணந்தி முனிவர்
திருநெல்வேலி தென்னிந்திய
சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
திருநெல்வேலி – 6.

6. தமிழ் இலக்கிய வரலாறு - தமிழ்த்துறை தொகுப்பு
தூய மரியன்னை கல்லூரி (தன்னாட்சி), தூத்துக்குடி.

பார்வை நூல்கள்

1. நன்னூல் - பவணந்தி முனிவர்
திருநெல்வேலி தென்னிந்திய
சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
திருநெல்வேலி – 6.

2 தமிழ் இலக்கிய வரலாறு - ச.வே.சுப்பிரமணியன்
மணிவாசகர் பதிப்பகம்
31, சிங்கர் தெரு
பாரிமுனை, சென்னை – 18.

3. சிறுகதைக் களஞ்சியம் - அ.சிதம்பரநாதச் செட்டியார் (தொகுப்பாசிரியர்)
புக்ஸ் (இந்தியா) பிரைவேட்.,
சென்னை – 1.

இணைய ஆதாரங்கள்

1. Project Madurai –www.projectmadurai.org
2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>
3. Tamil Books on Line – books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	**<40%**	**≥ 40%and<70%**	**≥70%**
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – I			
Part I French	**Foundation Course: Paper I – French – I**		
Course Code: 23ULFA11/ 23ULFB11	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- Identify the basic French sentence structure
- Comprehend various grammatical tenses and use them to communicate in French
- Review various documents and discuss them to understand the vocabulary
- Analyze and interpret expressions used to convey the cause, the effect, the purpose, and the opposition in French
- Perceive the French culture and system.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	Remember the usage of grammatical tenses in constructing sentences.	K1
CO-2	Apply the grammar rules and vocabulary to produce grammatically correct sentences.	K2
CO-3	Appreciate the French culture and civilization.	K3
CO-4	Demonstrate knowledge of various expressions used to express opinions, emotions, cause, effect, purpose, and hypothesis in French	K4
CO-5	Evaluate and summarize with thorough understanding the given texts.	K5

SEMESTER – I			
Part I French	**Foundation Course: Paper I – French - I**		
Course Code: 23ULFA11/ 23ULFB11	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Salut, Enchante

1.1 - Saluer
1.2 - Se présenter
1.3 - Présenter quelqu'un
1.4 - En France et ailleurs
1.5 - L'Europe

Unit II – J'adore

2.1 - Exprimer ses gouts
2.2 - Echanger sur ses projets
2.3 - Compléter une fiche d'inscription
2.4 - Remplir un chèque bancaire
2.5 - La famille en France

Unit III – Tu veux bien ?

3.1 - Demander à quelqu'un poliment
3.2 - Parler des actions passées
3.3 - Comprendre le récit d'actions passées
3.4 - Ecrire un message électronique
3.5 - Animaux et compagnie

Unit IV – On se voit quand ?

4.1 - Proposer, accepter ou refuser une invitation
4.2 - Indiquer l'heure et la date
4.3 - Fixer un rendez-vous
4.4 - Comprendre les informations de cartons d'invitation
4.5 - Les français cultivent leur temps libre

Unit V – Bonne idée !

5.1 - Exprimer son point de vue
5.2 - S'informer sur le prix et la quantité
5.3 - Faire des achats dans un magasin
5.4 - Comprendre des offres des cadeaux
5.5 - Quel cadeau offrir ?

Textbook: Régine Mérieux & Yves Loiseau, *Latitudes* -1- (A1 /A2), méthode de français, Didier, 2017 (units 1 - 6 only)

Books, Journals and Learning Resources

- J.Girardet & J.Pécheur avec la collaboration de C.Gibble, Echo A1, CLE international, Paris, 2012.
- Carlo Catherine, Causa Mariella, Civilisation Progressive du Français – I, Paris : CLE International, 2003.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, Dupleix Dorothée, Cocton Marie-Noëlle, *Saison 1 Niveau 1, Méthode de français et cahier d'exercices*, Paris : Didier, 2015

Web Resources:

https://www.lawlessfrench.com/faq/lessons-by-level/

https://bonjourdefrance.com/

www.francaisfacile.com/exercices /

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	2	1	1	3	3	2	1	1
CO-2	2	3	2	1	1	3	3	2	1	1
CO-3	2	2	1	3	3	1	2	3	3	3
CO-4	3	3	1	3	2	2	3	3	2	3
CO-5	3	2	1	1	2	2	2	2	2	2
Ave.	2.6	2.4	1.4	1.8	1.8	2.2	2.6	2.4	1.8	2

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER-I			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English-I**		
Course Code: 23UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Learning Objectives:

- To enable learners to acquire self-awareness and positive thinking required in various life situations.
- To help them acquire the attribute of empathy
- To assist them in acquiring creative and critical thinking abilities
- To enable them to learn the basic grammar
- To assist them in developing LSRW skills

Course Outcomes			
Course Outcomes	**Upon completion of the course, the students will be able to**	**PSOs Addressed**	**K Level**
CO 1	acquire self-awareness and positive thinking required in various life situations	1,2,3	1
CO 2	acquire the attribute of empathy.	2,3,5	2
CO 3	acquire creative and critical thinking abilities.	2,3,4	3
CO 4	learn basic grammar	4,5	4
CO 5	development and integrate the use of four language skills i.e., listening, speaking, reading and writing.	2,3,4,5	5

SEMESTER- I			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English –I**		
Course Code: 23UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

I SELF-AWARENESS(WHO) & POSITIVE THINKING(UNICEF)

Life Story

1.1 MalalaYousafzai - Chapter 1 from I am Malala

1.2 M.K.Gandhi - An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3)

Poem

1.3 Rabindranath Tagore - Where the Mind is Without Fear – Gitanjali 35

1.4 Chinua Achebe - Love Cycle

II EMPATHY

Poem

2.1 David Roth - Nine Gold Medals

2.2 William Wordsworth - Alice Fell or poverty

2.3 E.V. Lucas - The School for Sympathy

2.4 William Faulkner - Barn Burning

III CRITICAL & CREATIVE THINKING

Poem

3.1 Edgar Guest - The Things That Haven't Been Done Before

3.2 Robert Frost - Stopping by the Woods on a Snowy Evening

Readers Theatre

3.3 A Tale of China - The Magic Brocade

3.4 Aaron Shepard - Stories on Stage – (Three Sideway Stories from Wayside School" by Louis Sachar)

IV Part of Speech

4.1 Articles

4.2 Noun

4.3 Pronoun

4.4 Verb

4.5 Adverb

4.6 Adjective

4.7 Preposition

V Paragraph and Essay Writing

5.1 Descriptive

5.2 Expository

5.3 Persuasive

5.4 Narrative Reading Comprehension

Textbook:

Units I-III, V – To be compiled by the PG and Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Reference Books:

Martin Hewings. *Advanced English Grammar*. Cambridge University Press, 2000.

Web Resources:

1. MalalaYousafzai. I am Malala (Chapter 1) https://archive.org/details/i-am-malala
2. M.K Gandhi. An Autobiography or The Story of My Experiments with Truth(Chapter-1)- Rupa Publication, 2011 https://www.indiastudychannel.com/resources/146521Book-Review-An-Autobiography-or-The-story-of-my-experiments-withTruth.aspx
3. Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings)https://www.poetryfoundation.org/poems/45668/gitanjali-35
4. Aaron Shepard.Stories on Stage, Shepard Publications, 2017 https://amzn.eu/d/9rVzlNv
5. J C Nesfield. Manual of English Grammar and Composition. https://archive.org/details/in.ernet.dli.2015.44179

PSO Relation Matrix

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	2	3	2	3	2	3	3	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	2	3	3	3	3	2	3	2
CO-5	3	3	3	2	3	3	3	2	2	3
Ave.	2.8	3	2.6	2.6	2.8	3	3	2.6	2.8	2.8

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

Semester I			
CORE I - PLANT DIVERSITY I - ALGAE			
Course Code: 23UBOC11	**Hrs/ Week: 5**	**Hrs/ Semester: 75**	**Credits: 5**

OBJECTIVES

1. To provide a comprehensive knowledge on the biology of algae.
2. To provide a basis for better understanding of the evolution higher of plants.
3. To understand reproductive biology, ecology of plants by studying the simplersystems in algae.
4. To understand the role of algae in ecosystems as primary producers of nutrition.
5. To understand importance of algae to animals and humans.

COURSE OUTCOMES

CO	On completion of this course, students will	PO
CO1	relate to the structural organization, reproduction and significance of algae.	**K1**
CO2	demonstrate knowledge in understanding the various life cycle patterns, fundamental concepts in algal growth and cultivation.	**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.	**K4**
CO5	determine the emerging areas of algal biotechnology for identifying commercial potentials of algal products and their uses.	**K5**

Semester I			
CORE I - PLANT DIVERSITY I - ALGAE			
Course Code: 23UBOC11	**Hrs/ Week: 5**	**Hrs/ Semester: 75**	**Credits: 5**

UNIT I Classification (Fritsch-1935-1945), criteria for classification, algal distribution.

UNIT II Thallus organization (unicellular-*Chlorella,* Diatoms, colonial-*Volvox*, filamentous- *Anabaena*, *Oedogonium*, siphonous-*Caulerpa*, parenchymatous- *Sargassum, Gracilaria*).

UNIT III Reproduction-Vegetative, asexual, sexual reproduction and life histories (haplontic-, *Oedogonium* and *Chara,* diplontic-Diatoms and *Sargassum*, diplohaplontic-*Ulva* and diplobiontic-*Gracilaria*) (Examples may be changed according to the availability of the specimens).

UNIT IV Algal cultivation methods, Algal production systems; indoor cultivation methods and large-scale cultivation of algae, harvesting of algae.

UNIT V Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite. Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical. Phycoremediation. Role of algae in CO_2 sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence.

Recommended Texts

1. Dehradun. Edwardlee, R. 2018. Phycology, 5th Ed., Cambridge University Press, London.
2. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi
3. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, RastogiPublication, Meerut.
4. Ian Morris. 1977. An introduction to the algae. Hutchinson and Co (Publishers) Ltd. London.

References

1. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1
2. Mihir Kumar, D. 2010. Algal Biotechnology. Daya Publishing House, New Delhi.
3. Chapman V.J. and Chapman D.J, 2013. The Algae. Alpha Numera.
4. Fritsch, F.E. 1945. Structure and reproduction of Algae. Cambridge University press.
5. Round, FE. 1984. The Ecology of Algae. Cambridge University Press.
6. Lee, R.D. 2008.Phycology 4th Edition, Cambridge University Press, New York.
7. Bold, H.C and Wynne, M.J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi

Web Resources

1. https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382
2. https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382
3. https://www.crcpress.com/Algae-Anatomy-Biochemistry-and-Biotechnology- Second-Edition/Barsanti-Gualtieri/p/book/9781439867327
4. https://www.crcpress.com/Marine-Algae-Biodiversity-Taxonomy-Environmental-Assessment-and-Biotechnology/Pereira-Neto/p/book/9781466581678
5. https://www.kopykitab.com/Botany-For-Degree-Students-ALGAE-by-B-R- Vashishta-Dr-A-K-Sinha-Dr-V-P-Singh
6. https://www.wileyindia.com/a-textbook-of-algae.html
7. https://www.kobo.com/in/en/ebook/algae-biotechnology
8. https://www.ikbooks.com/books/book/life-sciences/botany/a-textbook-algae/9788188237449/

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	2	2	1
CO 2	3	3	2	2	3	3	2	`1	3	3
CO 3	2	2	1	1	2	2	1	3	2	2
CO 4	3	3	3	3	3	2	3	3	3	2
CO 5	3	3	2	3	2	3	3	3	2	3
Avg	2.8	2.8	1.8	2.4	2.4	2.2	2.2	2.2	2.4	2.2

Strong (3) **M-Medium (2)** **L-Low (1)**

Semester I			
CORE PRACTICAL I - ALGAE PRACTICAL			
Course Code: 23UBOCR1	**Hrs/ Week: 3**	**Hrs/ Semester: 45**	**Credits: 3**

OBJECTIVES

1. To develop skills to identify algae based on habitat, thallus structure and the internal organization.
2. To identify microalgae in a mixture.
3. To develop skills to prepare the microslides of algae.
4. To study the economic importance of few species.
5. To understand importance of algae to animals and humans

COURSE OUTCOME

CO	**On completion of this course, the students will be able to**	**PO**
CO1	recall and identify algae using key identification characters.	**K1**
CO2	demonstrate practical skills in preparation of fresh mount and identification of algal forms from algal mixture.	**K2**
CO3	describe the internal structure of algae prescribed in the syllabus	**K3**
CO4	decipher the algal diversity in fresh/ marine water and their economic significance.	**K4**
CO5	evaluate the various techniques used to culture algae for commercial purposes.	**K5**

Semester I			
CORE PRACTICAL I - ALGAE PRACTICAL			
Course Code: 23UBOCR1	**Hrs/ Week: 3**	**Hrs/ Semester: 45**	**Credits: 3**

EXPERIMENTS

1. Micro-preparation of the types prescribed in the syllabus.
2. Identifying the micro slides relevant to the syllabus.
3. Identifying types of algal mixture.
4. Economic importance of Algae as: (i) Food (ii) Feed (iii) Biofertilizers (iv) Seaweedliquid fertilizer (v) Hydrogen production by algae (vi) SCP (vii) Agar Agar (viii) Alginate (ix) Diatomaceous earth.
5. Field visit to study fresh water/marine water algal habitats. Visit to nearby industry actively engaged in algal technology.

Recommended Texts

1. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi.
2. Bendre, M. Ashok and Ashok Kumar, A. 2020. Text Book of Practical Botany-1 (10th ed). Rastogi Publications, Meerut.
3. Round, FE. 1984. The Ecology of Algae. Cambridge University Press.
4. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1.
5. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.

Reference Books

1. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri foodCanada publisher.
2. Chapman, V.J and Chapaman, D.J. 1960.The Algae, ELBS and MacMillan,London.
3. Lee, R.D. 2008.Phycology 4th Edition, Cambridge University Press, New York.
4. Dehradun. Edwardlee, R. 2018. Phycology, 5th Ed., Cambridge University Press, London.

Web resources

1. https://www.amazon.in/Practical-Manual-Algae-Sundara-Rajan/dp/8126106492
2. https://books.google.co.in/books/about/Practical_Manual_of_Algae.html?id= 8d5DAAAACAAJ&redir_esc=
3. https://freebookcentre.net/biology-books-download/Concepts-of-Botany-Algae- (PDF-21P).html
4. https://www.ebooks.com/en-in/book/210152662/algae/sachin-kumar-mandotra/
5. https://books.google.co.in/books/about/Algae.html?id=s1P855ZWc0kC&redir_es c=y

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	1	3	2	1	2	3	2	1
CO 2	3	3	2	2	3	3	2	3	3	3
CO 3	2	2	3	3	1	2	1	3	1	2
CO 4	3	3	3	3	3	2	3	3	3	2
CO 5	3	3	2	2	2	3	3	3	2	3
Avg	2.8	2.8	2.2	2.6	2.2	2.2	2.2	3	2.2	2.2

S-Strong (3) M-Medium (2) L-Low (1)

SEMESTER I			
Elective: Diversity of Invertebrates and Chordates			
Course Code: 23UZOE11	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Objectives

- To enlighten the students about the concepts of diversity, adaptations, organization andtaxonomic status of invertebrates and vertebrates
- To develop skill of identification of animals and promote employment opportunities

Course Outcome

Co.No	Upon completion of this course, students will able to	CL
CO-1	describe the characteristic features of invertebrates and chordates.	K1
CO-2	explain the taxonomic position of animals and list out the economic importance	K2
CO-3	compile invertebrates and chordates into various groups based on morphological characters, adaptations in relation to their environment and gain skills in scientific approach	K3
CO-4	analyze various organs and internal systems of invertebrates and vertebrates and correlate its function.	K4
CO-5	evaluate the structural organisation, evolutionary significance of invertebrates and chordates and initiate their career opportunities	K5

Unit I Diversity of Invertebrates–I (12Hrs)

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 Diversity of Invertebrates – II (12Hrs)

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

Unit III Diversity of Chordates – I (12Hrs)

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

Unit IV Diversity of Chordates – II (12Hrs)

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

Unit V **Animal organisation** **(12Hrs)**

Structure and organization of - (i) Earthworm, (ii) Rabbit/Rat, (iii) Prawn/Fish

Text Book

1. Ekambaranatha Iyer - *Outlines of Zoology* Viswanathan Publication,1982.

Books for Reference

1. Ekambaranatha Iyar and T.N.Ananthakrishnian - *A Manual of Zoology* Vol. I Invertebrata. Viswanathan Pvt.Ltd.1990.

2. Ekambaranatha Iyar and T.N.Ananthakrishnan,- *A Manual of Zoology* –Vol. II Invertebrata. Viswanathan Pvt.Ltd.1990

3. Ekambaranatha Iyar and T.N.Ananthakrishnan,-*A Manual of Zoology* Vol. II. Chordata S. Vishwanathan Pvt. Ltd. 1990.

4. Jordan E.L. and P.S. Verma - *Invertebrate Zoology*,12th edn. S.Chand &Co. 1995.

Web Resource

1. www.sanctuaryasia.com
2. www.iaszoology.com

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	1	2	1	1	3	1	3	1	1
CO-2	3	1	2	3	1	3	2	2	3	2
CO-3	3	1	3	2	2	3	3	3	3	2
CO-4	3	2	2	1	1	2	2	2	2	1
CO-5	2	2	3	3	3	2	3	3	2	3
Ave.	2.6	1.4	2.4	2	1.6	2.6	2.2	2.6	2.2	1.8

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

Practicals

Course Code: 23UZOER1

Hours/Week :2 **Credits: 1**

Dissection : 1. Cockroach – digestive system

2. Cockroach - nervous system

3. Fish -digestive system

Mounting : 1. Mouth parts- Cockroach

2. Mouth parts - Mosquito

3.Scales -Placoid, Cycloid and Ctenoid4.Prawn appendages

SPOTTERS:

Paramecium ,Plasmodium, Scypha, *Leucosolenia*, Corals. *Taenia solium* –entire, *Ascaris*male and female. Earthworm, Prawn,*Scorpion*, *Pila*, Starfish, *Amphioxus*, Shark, Frog, Calotes, Pigeon feather, Rabbit.

Field visit – Study of fauna in the campus

Books for Reference

1. Ekambaranatha Iyyar and T. N. Ananthakrishnan, *A manual of Zoology* Vol.I (Part 1, 2) S. Viswanathan, Chennai.1995.
2. Ganguly, Sinha an d A dhikari, *Biology of Animals*: Volume I, New Central BookAgency; 3rd revised edition. 1008 pp. 2011.
3. Sinha, Chatterjee and Chattopadhyay,. Advanced Practical Zoology, Books &Allied Ltd; 3rd Revised edition, 1070 pp.2014.
4. Lal,S.S,. *Practical Zoology Invertebrate*, Rastogi Publications. 2016.
5. Verma, P. S. *A Manual of Practical Zoology*: *Invertebates*, S Chand, 497pp.2010. Lal SS,. *Practical Zoology Vertebrate*, Rajpal and Sons Publishing, 484pp. 2009

Semester I			
SKILL ENHANCEMENT COURSE I - ORGANIC FARMING			
Course Code: 23UBOSE1	**Hrs/ Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

OBJECTIVES

1. To enable students to gain knowledge on the scope of organic farming and its significance.
2. To impart practical insights sustainable agriculture, green manuring, recycling andcomposting.
3. To understand the physical and chemical properties of soil.
4. To study sustainable agriculture.
5. To know about the importance of biofertilizers.

COURSE OUTCOMES

CO	**On completion of this course, the students will be able to**	**PO**
CO1	recognize the types of soil pollution, manures and biofertilizers	**K1**
CO2	explain the concepts, components of organic farming, methods of vermicompost production and biocomposting.	**K2**
CO3	apply techniques to synthesize green manure and recycle biodegradable wastes.	**K3**
CO4	analyze the properties of soil and the significance ofbiofertilizer in soil fertility	**K4**
CO5	develop new strategies to enhance growth and quality of crop yield.	**K5**

Semester I			
SKILL ENHANCEMENT COURSE I - ORGANIC FARMING			
Course Code: 23UBOSE1	**Hrs/ Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

UNIT I Soil – physical, chemical properties. Soil pollution – oil, chemicals – fertilizers, pesticide and herbicide, non-degradable solids, biomagnification, consequencesof land pollution – damage to soil and crops.

UNIT II Organic farming – definition, basic concept of organic farming, integrated plant nutrient supply management, integrated insect pest and disease management, integrated soil and water management. Sustainable agriculture practices-crop rotation, mixed cropping.

UNIT III Management of organic wastes and green manures: Farm manures, Composts, Mulches and pest control, importance of organic manure, importance of green manure, crops of green manure, oil cake. Animal based organic manure–cow dung, vermicompost-methods, production and utilization.

UNIT IV Biofertilizers–classification, nitrogen fixers–Rhizobium, Cyanobacteria, Azollaand Vesicular Arbuscular Mycorrhiza.

UNIT V Recycling of bio-degradable municipal, agricultural and Industrial wastes –biocompost making methods.

Recommended Texts

1. NIIR Board. 2012. The complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services.
2. Sathe, T.V. 2004. Vermiculture and Organic Farming. Daya publishers.
3. Subba Rao N.S. 2017. Biofertilizers in Agriculture and Forestry. FourthEdition. Medtech.
4. Vayas,S.C, Vayas, S. and Modi, H.A. 1998. Bio-fertilizers and organic Farming
5. Akta Prakashan, Nadiad. Dongarjal, R.P and Zade, S.B. 2019. Insect Ecology and Integrated Pest Management Akinik Publications, New Delhi.

Reference Books

1. Vayas,S.C, Vayas, S and Modi, H.A. 1998. Bio-fertilizers and organic Farming Akta Prakashan, Nadiad.
2. Sathe, T.V.2004. Vermiculture and Organic Farming. Daya publishers.

3. Subha Rao, N.S.2000. Soil Microbiology, Oxford & IBH Publishers, New Delhi.
4. Reddy, S.R. 2019. Fundamentals of Agronomy Kalyani Publications, Uttar Pradesh
5. Tolanur, S. 2018. Fundamentals of Soil Science IInd Edition , CBS Publishers,New Delhi

Web Resources

1. https://www.amazon.com/Beginners-Practical-botanical-horticulture- landscape-ebook/dp/B00MOURUNY
2. https://www.e-booksdirectory.com/listing.php?category=323
3. http://www.freebookcentre.net/Biology/Agriculture-Books.html
4. https://casfs.ucsc.edu/about/publications/Teaching-Organic- Farming/PDF-downloads/TOFG-all.pdf
5. https://www.amazon.in/s?k=the+organic+farming+manual&hvadid=726365635 75133&hvbmt=bb&hvdev=c&hvqmt=b&tag=msndeskstdin- 21&ref=pd_sl_6sbf0qtxcy_b

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2	1	1	1	2	3
CO 2	3	2	2	3	2	2	2	2	2	3
CO 3	2	3	2	3	3	2	2	2	3	3
CO 4	3	2	2	2	2	1	2	3	3	3
CO 5	3	2	3	3	3	1	3	2	3	3
Avg	2.8	2.2	2	2.8	2.4	1.4	2	2	2.6	3

S-Strong (3) M-Medium (2) L-Low (1)

Semester I			
FOUNDATION COURSE - BASICS OF BOTANY			
Course Code: 23UBOF11	**Hrs/ Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

OBJECTIVES

1. To learn about the classification, distinguishing traits, geographic distribution, andreproductive cycle of algae, fungi, lichens, and bryophytes.
2. To understand the biodiversity by describing and explaining the morphology andreproductive processes of algae, fungi, bryophytes and microorganisms.
3. To investigate the classification, distinctive traits, distribution and reproduction and life history of the various classes and major types of Pteridophytes and Gymnosperms.
4. Enable to learn various cell structures and functions of prokaryotes and eukaryotes and understand the salient features and functions of cellular organelles.
5. Understanding of laws of inheritance, genetic basis of loci and alleles.

COURSE OUTCOMES

CO	**On completion of this course, the students will be able to**	**PO**
CO1	recall the two and five kingdom classification, cell, morphology of a plant, basics of gene and basics of plant physiology	**K1**
CO2	explain the general characters of plant kingdom, basics of prokaryotic and eukaryotic cells, types of root and shoot modification, Mendel's law of inheritance and concept of stomatal movement.	**K2**
CO3	compile a clear understanding about the characteristics of pteridophytes and gymnosperms, cell organelles, types of inflorescence, mono and dihybrid cross and water relations	**K3**
CO4	analyze the structure and function of plant kingdom, cells and explain the development of floral organs, mendelian concept and types of transpiration.	**K4**
CO5	criticize the core concepts and fundamentals of plant biotechnology and genetic engineering.	**K5**

Semester I			
FOUNDATION COURSE - BASICS OF BOTANY			
Course Code: 23UBOF11	**Hrs/ Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

UNIT I **Biodiversity**

Systematics: Two Kingdom and Five Kingdom systems - Salient features of various Plant Groups: Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms- Viruses - Bacteria.

UNIT II **Cell biology**

Cell as the basic unit of life - Prokaryotic and Eukaryotic Cell (Plant Cell) - Light Microscope and Electron Microscope Ultra Structure of Prokaryotic and Eukaryotic Cells - Cell Wall - Cell Membrane, chloroplast, mitochondria, ribosomes.

UNIT III **Plant morphology**

Structure and Modification of Root, Stem and Leaf - Structure and Types of Inflorescences - Structure and Types of Flowers, Fruits and Seeds.

UNIT IV **Genetics**

Concept of Heredity and Variation - Mendel's Laws of Inheritance monohybridand dihybrid cross

UNIT V **Plant physiology**

Cell as a Physiological Unit: Water relations -Absorption and movement: Diffusion, Osmosis, Plasmolysis, Imbibition -Permeability, Water Potential – Transpiration – Movement, guttation - Mineral Nutrition

Recommended Texts

1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International
3. (P) Ltd., Publishers, Bengaluru.
4. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
5. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
6. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I and II, S.Chand and Co. New Delhi.

7. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.

Reference books

1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes – Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand and Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand and Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.

Web Resources

1. https://www.kobo.com/us/en/ebook/the-algae-world
2. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF- 15P).html
3. http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm
4. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/
5. https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine- cones-an- introduction-to-gymnosperms.pdf
6. https://www.us.elsevierhealth.com/medicine/cell-biology
7. https://www.us.elsevierhealth.com/medicine/genetics https://www.kobo.com/us/en/ebook/plant-biotechnology-1

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	1	1	1	2	3	3	2	3	3
CO 2	3	2	1	1	2	3	3	3	3	3
CO 3	2	2	2	2	3	3	3	3	3	3
CO 4	3	3	2	2	2	3	3	3	3	3
CO 5	3	2	2	3	2	3	2	3	2	2
Avg	2.6	2	1.6	1.8	2.2	3	2.8	2.8	2.8	2.8

S-Strong (3) M-Medium (2) L-Low(1)

SEMESTER - II			
Part -1 Tamil பொதுத்தமிழ் - தாள் 2 - சமய இலக்கியங்கள் செய்யுள், இலக்கணம், இலக்கிய வரலாறு			
Code :23ULTA21	**Hrs/Week:6**	**Hrs/ Semester : 90**	**Credits :4**

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	இறை ஆற்றலை உணர்ந்துகொள்ள உதவுகிறது
2	தமிழ் மொழியைப் பிழையின்றி எழுதவும் பேசவும் முடியும்.
3	அன்பு, இரக்கம், நற்சொல், நற்செயல் போன்ற நற்பண்புகளோடு வாழ வழி வகுக்கிறது.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர். துறைதோறும் தமிழ் மொழியின் வளர்ச்சியை அறிவர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	**இப்பாடத்திட்டம் - மாணவியரிடம்**	**அறிவாற்றல் திறன்**
CO-1	தமிழரின் சமய தத்துவங்களை அறிந்து தெளிவு பெறுவர்	K1
CO-2	பல்வேறு சமய கருத்துகளை அறிவதன் மூலம் சமய ஒற்றுமை உணர்வு பெறுவர்.	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல்	K3
CO-4	இறைவன் முன் அனைவரும் சமம் என்ற சிந்தனையை உருவாக்குகிறது.	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	K5

அலகு – 1 **(18 மணி நேரம்)**

பக்தி இலக்கியம்

1. திருநாவுக்கரசர் தேவாரம் - நாமார்க்கும் குடியல்லோம் எனத் தொடங்கும் வரிகள் - 10 பாடல்கள்
2. ஆண்டாள் - திருப்பாவை (முதல் 10 பாசுரம்)

அலகு – 2 **(18 மணி நேரம்)**

1. வள்ளலார் - அருள் விளக்கமாலை (முதல் 10 பாடல்கள்)
2. எச்.ஏ. கிருட்டிணப்பிள்ளை - இரட்சணிய மனோகரம் - பால்ய பிரார்த்தனை
3. குணங்குடி மஸ்தான் சாகிபு – பராபரக்கண்ணி (முதல் 10 கண்ணிகள்)

அலகு – 3 **(18 மணி நேரம்)**

சிற்றிலக்கியங்கள்

1. தமிழ்விடு தூது - (முதல் 20 கண்ணிகள்)
2. திருக்குற்றாலக் குறவஞ்சி - குறத்தி மலைவளம் கூறுதல்
3. முக்கூடற்பள்ளு - நாட்டு வளம்

அலகு – 4 **(18 மணி நேரம்)**

இலக்கணம்

1. சொல்லின் பொது இலக்கணம்
2. ஓரெழுத்து ஒரு மொழிகள், சொல்லின் வகைகள்
3. பெயர்ச்சொல் - அறுவகைப் பெயர்கள்
4. வினைச் சொல் - இலக்கணம் - வகைகள்
5. இடைச்சொல் - இலக்கணம் - வகைகள்
6. உரிச்சொல் - இலக்கணம் - வகைகள்

அலகு - 5 **(18 மணி நேரம்)**

இலக்கிய வரலாறு

1. பன்னிரு திருமுறைகள்
2. நாலாயிர திவ்யப் பிரபந்தம்
3. திருமடங்களின் தமிழ்ப்பணி
4. சைவ சித்தாந்த சாத்திரங்கள்

துணைநின்ற நூல்கள்

1. பன்னிரு திருமுறைகள் - பேரா. அ. மாணிக்கம் (உரையாசிரியர்)
   வர்த்தமானன் பதிப்பகம்
   21, இராமகிருஷ்ணா தெரு
   தியாகராய நகர்
   சென்னை – 17.

2. திருக்குறள் - பரிமேலழகர் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.
3. நாலடியார் - தி.சு. பாலசுந்தரம் பிள்ளை
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

பார்வை நூல்கள்

1. நன்னூல் - பவணந்தி முனிவர்
   திருநெல்வேலி தென்னிந்திய

சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
திருநெல்வேலி – 6.

2. தமிழ் இலக்கிய வரலாறு - தமிழ்த்துறை தொகுப்பு
தூய மரியன்னை கல்லூரி (தன்னாட்சி),
தூத்துக்குடி.

3. பதினெண் கீழ்க்கணக்கு நூல்கள் - எம். நாராயண வேலுப்பிள்ளை
நர்மதா பதிப்பகம், தியாகராய நகர், சென்னை.

இணைய ஆதாரங்கள்

1. Project Madurai –www.projectmadurai.org
2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>
3. Tamil Books on Line – books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	**<40%**	**≥ 40%and<70%**	**≥70%**
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER - II			
Part I French	**Foundation Course: Paper II – French – II**		
Course Code: 23ULFA21/ 23ULFB21	**Hrs / Week: 6**	**Hrs / Semester : 90**	**Credits:3**

Learning Objectives:

- To revise basic French sentence structure and vocabulary.
- To enumerate the various grammatical tenses and use them to communicate better in French.
- To develop the language proficiency of the learners by practising all for competencies: Reading, writing, listening, and speaking.
- To analyse and interpret verbal expressions of cause, effect, purpose, and opposition in French
- To comprehend text passages and use them to express their opinions.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	Identify the purpose of using various tenses and effectively employ them in speaking and writing	K1
CO-2	Summarize a French document such as posters, bulletins, and infographics	K2
CO-3	Discuss the French culture and the differences.	K3
CO-4	Analyse and utilize the grammatical concepts in drafting sentences and paragraphs	K4
CO-5	Demonstrate knowledge of various expressions used to convey opinion, emotions, cause, effect, purpose, and hypothesis in French	K5

SEMESTER - II			
Part I French	**Foundation Course: Paper II – French - II**		
Course Code: 23ULFA21/ 23ULFB21	**Hrs / Week: 6**	**Hrs / Semester : 90**	**Credits:3**

Unit I – C'est où ?

1.1 - Demander et indiquer une direction
1.2 - Localiser
1.3 - Comprendre des indications de direction et de lieu
1.4 - Se repérer sur un plan de ville
1.5 - Architecture et nature

Unit II – N'oubliez pas

2.1 - Exprimer l'obligation ou l'interdit
2.2 - Conseiller
2.3 - Comprendre une chanson
2.4 - Comprendre un récit de vacances
2.5 - La France d'Outre-mer

Unit III - Belle vue sur la mer

3.1 - Décrire un lieu
3.2 - Se situer dans le temps
3.3 - Comprendre la description d'un lieu
3.4 - Comprendre des pictogrammes
3.5 - L'Union européenne

Unit IV – Quel beau voyage, Oh Joli

4.1 - Raconter un souvenir
4.2 - Exprimer l'intensité et la quantité
4.3 - Comparer
4.4 - Francophonie
4.5 - Mode et société

Unit V – Les compétences communicatifs

5.1 - Les lettres formelles
5.2 - Les lettres informelles

Textbook: Régine Mérieux & Yves Loiseau, *Latitudes* -1- (A1 /A2), méthode de français, Didier, 2017 (units 7-11 only)

Books, Journals and Learning Resources

- J.Girardet & J.Pécheur avec la collaboration de C.Gibble, Echo A1, CLE international, Paris, 2012.
- Carlo Catherine, Causa Mariella, Civilisation Progressive du Français – I, Paris : CLE International, 2003.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, Dupleix Dorothée, Cocton Marie-Noëlle, *Saison 1 Niveau 1, Méthode de français et cahier d'exercices*, Paris : Didier, 2015

Web Resources:
https://www.lawlessfrench.com/faq/lessons-by-level/
https://bonjourdefrance.com/

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	2	1	1	3	3	2	1	1
CO-2	2	3	2	1	1	3	3	2	1	1
CO-3	2	2	1	3	3	1	2	3	3	3
CO-4	3	3	1	3	2	2	3	3	2	3
CO-5	3	2	1	1	3	3	3	3	3	3
Ave.	2.6	2.4	1.4	1.8	1.8	2.4	2.8	2.6	2	2.2

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER - II			
Part II English	**Poetry, Prose, Extensive Reading, and Communicative English - II**		
Course Code: 23UGEN21	**Hrs / Week: 6**	**Hrs / Semester : 90**	**Credits:3**

Unit I – Resilience

Poetry

William Ernest Henley : Invictus

Maya Angelou : Still I Rise

Prose

Julian Koepcke : How I Survived a Plane Crash

Unit II – Decision Making Skills

Poetry

Rudyard Kipling : If

Stanley Kunitz : The Layers

Short Story

Frank Stockton : The Lady or the Tiger

Unit III - Problem Solving Skills

Prose- Life Story

Sudha Murthy : How I taught My Grandmother to Read

Autobiography

A. J. Cronin : Two Gentlemen of Verona

A.P.J. Abdul Kalam : Wings of Fire (Chapters 1,2,3)

Unit IV – Language Competency

Tenses

Present Tense

Past Tense

Future Tense

Unit V - English at the Workplace

E-mail – Invitation, Enquiry, Seeking Clarification

Formal Letters

Circular

Minutes of the Meeting

Textbook:

Units I-III, V – To be compiled by the PG and Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Reference Books:

Martin Hewings. *Advanced English Grammar*. Cambridge University Press, 2000.

Web Resources:

https://www.poetryfoundation.org/

https://www.teachingenglish.org.uk/teaching-resources/teaching-adults/lesson-plans

https://www.perfect-english-grammar.com/support-files/tenses-explanations.pdf

PSO Relation Matrix

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	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	3	2	3	2	3	2	2
CO-2	2	3	3	3	3	2	3	2	2	3
CO-3	3	3	3	3	3	3	3	2	2	3
CO-4	2	3	3	3	2	2	3	3	2	2
CO-5	3	3	3	2	2	3	3	3	3	2
Ave.	2.6	2.8	3	2.8	2.4	2.6	2.8	2.6	2.2	2.4

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER II			
Core II - PLANT DIVERSITY II - FUNGI, BACTERIA, VIRUSES, PLANT PATHOLOGY AND LICHENS			
Course Code: 23UBOC21	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credit: 5**

OBJECTIVES

1. To describe the classification and general characteristics of fungi as being heterotrophic, Unicellular/multicellular.
2. To understand the production of industrially important production from fungi.
3. To comprehensively explain the bacteria, covering their classification, general characteristics, bacterial affiliates and economic importance.
4. To provide a comprehensive understanding of viruses, encompassing their classification, structure, multiplication mechanisms and the impact of specific viral diseases on plants.
5. To understand lichen structure, function, identification, and ecology; comprehend the events of symbiosis and lichenization and to demonstrate the use of lichens as bioindicator species.

COURSE OUTCOMES

CO. No	On completion of this course, the students will be able to:	PO
CO1	recall the general characteristics of fungi, bacteria, virus and lichen.	**K1**
CO2	recognize the classification of fungi, bacteria, virus and lichen.	**K2**
CO3	illustrate the structure and reproduction of fungi, bacteria, virus and lichen.	**K3**
CO4	examine the symptoms and control measures of plant diseases.	**K4**
CO5	estimate the economic importance of fungi, bacteria, virus and lichen.	**K5**

SEMESTER II			
Core II PLANT DIVERSITY II - FUNGI, BACTERIA, VIRUSES, PLANT PATHOLOGY AND LICHENS			
Course Code:23UBOC21	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credit: 5**

UNIT I **Fungi:** Classification of fungi (Alexopoulos and Mims, 1979). General characters of the following groups: Phycomycetes, Zygomycetes, Ascomycetes, Basidiomycetes, Deuteromycetes. Structure, reproduction and life-history of *Albugo, Rhizopus*, *Peziza*, *Puccina* and *Cercospora*.

UNIT II **Production of industrially important products from fungi:** Alcohol (ethanol), organic acids (citric acid), enzymes (protease). Vitamins (Vitamin B-complex and Vitamin B-12), antibiotics (Penicillin). Importance of VAM fungi. Fungi used as biofertilizers. Harmful effects of Fungi.

UNIT III **Bacteria:** Classification (Bergey's, 1994), General characters, structure, nutrition and reproduction of bacteria. Bacterial Affiliates: Actinomycetes, Rickettsiae, Myxobacteria. Economic importance of bacteria: beneficial and harmful activities of bacteria. General symptoms of bacterial diseases. Symptoms, etiology and control measure of Citrus canker and Angular leaf spot of cotton.

UNIT IV **Virus:** Definition, General characters, types of viruses, genetic material of viruses, structure of virion. Classification of virus: old system – Holmes (1948), new system - Lwoff, Horne and Tournier (1962). Structure and multiplication of Tobacco mosaic virus. Structure of Bacteriophage. General symptoms of viral diseases. Symptoms, etiology and control measure of Bunchy top of banana and Tomato black ring,

UNITV **Lichen:** Classification (Hale, 1969). Habitat, structure, nature of association between algae and fungi. Study of growth forms of lichens (crustose, foliose and fruticose). Distribution, thallus organization, reproduction and ecological significance of lichens with special reference to Usnea and *Parmelia.* Economic importance of Lichens.

Recommended Texts

1. Pandey, B.P. 1997. College Botany. Vol. I Fungi and Pathology. S.Chand , New Delhi.
2. Verma,V.2015. Botany. Ane Books Pvt.Ltd. New Delhi.
3. Pandey, S.N. Trivedi, P.S.2006. Sunrise Printers, New Delhi.
4. Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata.

Reference Books

1. Alexopoulos, C.J., Mims, C.W., Blackwell, M. 1996. Introductory Mycology. 4th edition. John Wiley and Sons (Asia) Singapore.
2. Webster, J and Weber, R. 2007. Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
3. Sharma, O.P. 2011. Fungi and allied microbes The McGraw –Hill companies, New Delhi.
4. Burnett, J.H. 1971. The fundamentals of Mycology. ELBS Publication, London.
5. Bessey, E.A. 1979. Morphology and Taxonomy of fungi, Vikas publishing House Pvt. Ltd, New Delhi.
6. DharaniDharAwasthi. 2000. A Handbook of Lichens Vedams eBooks (P) Ltd. New Delhi.

7. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. 1983. Microbiology, Tata MaGraw Hill Publishing House, New Delhi.
8. Pandey, P.B. 2014. College Botany- 1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. Chand Publishing, New Delhi.
9. Mishra, A. and Agarwal, R.P. 1978. Lichens – A Preliminary Text. Oxford and IBH.

Web Resources

1. https://www.amazon.in/Fungi-Sarah-C-Watkinson-ebook/dp/B0199YFDFE
2. http://www.freebookcentre.net/biology-books-download/A-text-book-of-mycology-and-plant-pathology.html
3. http://www.freebookcentre.net/Biology/Mycology-Books.html
4. https://www.kobo.com/us/en/ebook/introduction-to-fungi
5. http://www.freebookcentre.net/biology-books-download/Introductory-Mycology.html
6. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html

MAPPING WITH PROGRAMME OUTCOMES:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	2	1	2	2	2	2
CO2	3	2	2	3	3	2	1	2	1
CO3	2	3	3	1	2	1	3	1	3
CO4	3	3	3	3	2	3	3	3	3
CO5	3	2	3	2	3	3	3	3	3
Avg	2.8	2.2	2.8	2.2	2.2	2.2	2.4	2.2	2.4

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMASTER - II			
CORE PRACTICAL II - FUNGI, BACTERIA, VIRUSES, PATHOLOGY AND LICHENS PRACTICAL			
Course Code: 23UBOCR2	**Hrs/week: 3**	**Hrs/Semester: 45**	**Credit: 3**

OBJECTIVES

1. To enable students to identify microscopic and macroscopic fungi.
2. To prepare microslides of fungi and lichens.
3. To know the presence of pathogen inside the plant tissues through microscopic sections.
4. To identify the bacteria based on the morphology, and microslides
5. To know the economic importance of the microbes studied.

COURSE OUTCOMES

CO	On completion of this course, the students will be able to:	PO
CO1	identify microbes, fungi and lichens using key identifying characters	**K1**
CO2	discuss the vegetative and reproductive structure of microbes	**K2**
CO3	implement the suitable control measures for the common plant diseases.	**K3**
CO4	analyze the characteristics of microbes, fungi and plant pathogens	**K4**
CO5	estimate the useful role of fungi in agriculture and pharmaceutical industry.	**K5**

SEMASTER - II			
CORE PRACTICAL II- PLANT DIVERSITY II FUNGI, BACTERIA, VIRUSES, PATHOLOGY AND LICHENS PRACTICAL			
Course Code: 23UBOCR2	**Hrs/week: 3**	**Hrs/Semester: 45**	**Credit: 3**

EXPERIMENTS

1. Micropreparation of *Albugo*, *Peziza*, *Puccina* to study the vegetative and reproductive structures.
2. Micropreparation of *Usnea* and *Parmelia* to study the vegetative and reproductive structures.
3. Identification of microbes from contaminated food.
4. Study of economically important products obtained from fungi, Bacteria and Lichen. (biofertilizers, biopesticides, biofungicide (*Trichoderma*), edible mushroom/Yeast, organic acids (citric acid) enzymes (protease), antibiotics and vitamins).
5. Identifying the slides relevant to the syllabus.
6. Identification of diseases: Bacterial diseases – Citrus canker and Angular leaf spot of cotton.
    - Viral diseases – Bunchy top of banana and Tomato black ring,
    - Fungal diseases – Blast disease in rice and Tikka disease
7. Herbarium specimens of bacterial diseases/photograph.
8. Submission of Record note book.

Recommended Texts

1. Chmielewski, J.G and Krayesky, D. 2013.GeneralBotany laboratory Manual.AuthorHouse, Bloomington, USA.
2. Das,Sand Saha,R.2020. Microbiology Practical Manual. CBS Publishers and Distributors, (P) Ltd., New Delhi, India.
3. Webster, Jand Weber,R. 2007. Introduction to Fungi, 3rd Ed. Cambridge University Press, Cambridge.
4. Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata.

Reference Books

1. Alexopoulos, Jand Mims,W. 1985.Introductory Mycology, Wiley Eastern Limited NewDelhi.
2. Bendre, M .Ashok and Ashok Kumar, A. 2020.Text Book of Practical Botany 1 (10th ed). Rastogi Publications, Meerut.
3. Singh, R and U.C. Singh 2020. Modern mushroom cultivation, 3rd Edition Agrobios (India), Jodhpur.
4. Poonam Singh and Ashok Pandey. 2009. Biotechnology for agro-Industrial residues utilization. Springer.
5. Satyanarayana T and Johri B.N. 2005. Microbial diversity, Current Perspectives and Potential Applications, IK International.

Web resources

1. https://www.amazon.in/Practical-Manual-Fungi-Fungicides/dp/B0025AEFP4
2. https://books.google.co.in/books/about/Practical_Mycology.html?id=5ycJAQAAMAAJ&redir_esc=y
3. https://www.flipkart.com/colour-handbook-practical-plant-pathology/p/itmefsn6dyhfhs9b
4. https://books.google.co.in/books/about/Practical_Botany.html?id=T5narQEACAAJ&redir_esc=y
5. https://www.kobo.com/us/en/ebook/introduction-to-fungi

MAPPING WITH PROGRAMME OUTCOMES:

COs	COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	1	2	2	2	1
CO2	2	3	2	2	3	3	2	3	3	3
CO3	2	2	3	3	1	2	1	3	1	2
CO4	3	3	3	3	3	2	3	3	3	2
CO5	3	3	2	3	2	3	3	3	2	3
Avg	2.6	2.8	2.2	2.8	2.2	2.2	2.2	2.8	2.2	2.2

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER II			
Generic Elective II: Physiology, Developmental Zoology, Immunology and Genetics			
Course Code: 23UZOE21	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Objectives

- To enable students to learn basic concepts relating to the aspects of physiology, developmental zoology, immunity and human genetics
- To enable the students to differentiate the healthy physiological condition fromabnormal or diseased states

Course Outcome

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	recall the parts and working of body organs and developmental stages, different types of immune system and name the patterns of inheritance	K1
CO-2	interpret the basics on organogenesis, anatomy, physiology, immunity and inheritance of human body	K2
CO-3	identify various health issues associated with human physiology	K3
CO-4	analyze immune responses, vaccination schedule and patterns of inheritance	K4
CO-5	assess the physiological conditions in a healthy state as well as aberrant or pathological states	K5

Unit I **Physiology** **(12Hrs)**

Respiration: Respiratory pigment – haemoglobin, transport of gases. Mechanism of blood clotting - Structure of neuron – Conduction of nerve impulse through neuron and synapse

Unit II **Excretion and Reproduction** **(12Hrs)**

Excretion: Types of excretory products – Structure of kidney and nephron – mechanism of urine formation

Reproduction: Structure of human testis and ovary, Graafian follicle, menstrual cycle and its hormonal control, menopause.

Unit III **Developmental Zoology** **(12Hrs)** Frog: Fertilization, Cleavage and Gastrulation, Organogenesis - Development of heart and brain.

Placentation in mammals

Unit IV **Immunology** **(12Hrs)**

Innate and acquired - Active and passive; Antigens and Antibodies; Immunological organs– Primary lymphoid organs - Thymus and bone marrow; Secondary Lymphoid organs - Lymph nodes and spleen; Immune responses in humans; Vaccination schedule by WHO

Unit V **Human Genetics** **(12Hrs)**

Human Chromosomes – Sex Determination in Humans; Patterns of Inheritance: X-linked – Colour blindness, Y-linked - Hypertrichosis, Multiple Allelism – ABO blood group, Polygenic – Skin colour in man. Syndromes - Down syndrome, Turner's syndrome, Klinefelter's syndrome

Text Book

1. Verma P.S. & V.K. Agarwal - *Developmental Biology*, *Chordata Embryology*, S.Chand & Co. 2014.

Books for Reference:

1. Owen, J. A., J. Punt, & S.A. Stranford. Kuby *Immunology*. (7th ed.) New York: W.H. Freeman & Company. 2013.
2. Cummings, M.R., W.S. Klug, C.A. Spencer M.A. Palladino & D.Killian. *Concepts of Genetics*. (12th ed.). New Jersey: Pearson Education. 2019.
3. Verma P.S. & V.K. Agarwal - *Developmental Biology*, *Chordata Embryology*, S.Chand & Co. 2014.

PSO Relation Matrix

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	1	1	2	2	3	1	1	1	2
CO-2	3	1	1	2	2	3	2	1	2	1
CO-3	3	1	2	3	2	3	2	2	2	2
CO-4	3	2	2	3	2	3	2	2	2	2
CO-5	2	1	3	3	2	3	3	2	2	2
Ave.	2.8	1.2	1.8	2.6	2	3	2	1.3	1.8	1.8

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

Elective II - Practical **Course Code: 23UZOER2**

Hrs/Week:2 **Credit :1**

1. Examination and analysis of Ammonia, Urea and Uric acid

2. Estimation of haemoglobin using haemometer

3. Effect of temperature on the opercular movement in fish and calculation of Q10

4. Observation of models, charts and diagrams

   Human heart, haemoglobin, neuron, eye and Snellan chart for vision test

5. Spotters – Slides and Specimen

   Frog: Egg, blastula, gastrula – yolk plug stage:

   Any two placenta – Cotyledonary and Diffused placenta

6. Primary lymphoid organs - Thymus and bone marrow; Secondary Lymphoid organs - Lymphnodes and spleen

7. Charts - Human Karyotype, Colour Blindness, Hypertrichosis, Down syndrome, Turner's syndrome, Klinefelter's syndrome

8. Examination of ABO blood group – Demonstration

Reference Books:

1. Widmaier, E.P., H. Raff, K.T. Strang. 2008. Vander's *Human Physiology: themachanism of body function*. XI Edition, McGraw Hill., 770 PP. 2007
2. Verma P.S. & V.K. Agarwal - *Developmental Biology, Chordata Embryology*, S. Chand& Co. 2014.
3. Owen, J. A., J. Punt, & S.A. Stranford. Kuby *Immunology*. (7th ed.) New York: W.H. Freeman & Company. 2013.
4. Cummings, M.R., W.S. Klug, C.A. Spencer M.A. Palladino & D.Killian. *Concepts of Genetics*. (12th ed.). New Jersey: Pearson Education. 2019.
5. Abhijit Dutta, *Experimental biology*: A Laboratory Manual, Naroa, New Delhi. 2009.

Semester II			
SKILL ENHANCEMENT COURSE II - MUSHROOM CULTIVATION			
Course Code: 23UBOSE2	**Hrs/ Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

OBJECTIVES

1. To understand and appreciate the role of mushrooms in nutrition, medicine and health.
2. To learn and develop skills in mushroom cultivation.
3. To study new methods and strategies in storing mushroom.
4. To learn about diseases and post-harvest technology.
5. To cultivate various kinds of mushroom

COURSE OUTCOMES

CO. No.	On completion of this course, the students will be able to:	PO
CO1	recall the life cycle of edible mushrooms, steps in mushroom cultivation, preservation, disease and recipes of mushroom.	**K1**
CO2	explain the history and present status of mushroom, cultivation, preservation process and treatment of mushroom allergies.	**K2**
CO3	apply technique to identify poisonous mushroom, mushroom bed preparation and disease management.	**K3**
CO4	examine the diseases and pest factors and economic value associated with mushroom cultivation	**K4**
CO5	estimate and construct edible mushroom and their management.	**K5**

Semester II			
SKILL ENHANCEMENT COURSE II - MUSHROOM CULTIVATION			
Course Code: 23UBOSE2	**Hrs/ Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

UNIT I **Introduction:** History of mushroom cultivation, present status of mushroom industry in India. Morphology, nutritive value and uses of mushroom. Identification of edible and poisonous mushroom. Life cycle of *Pleurotus spp.* and *Agaricus spp.*

UNIT II **Cultivation of mushroom:** Mushroom farm location and layout, factors affecting mushroom cultivation. **Steps in mushroom cultivation**: Selection and sterilization of substrate, spawning (types, production, preparation of mother spawn, storage and transit), incubation.

UNIT III Common problems during processing of mushroom cultivation, harvesting and post harvesting. **Preservation of mushroom:** Short term storage, long term storage (canning and drying), marketing.

UNIT IV **Diseases management of mushroom: Fungal diseases:** Dry bubble or brown spot disease, wet bubble, green mould, Mildew of cobwel disease. **Bacterial diseases:** Bacterial pit, bacterial blotch or brown blotch. **Insect Pests:** Sciarid flies, Phorids, mites, nematodes.

UNIT V **Hands on training and Field work:** Cultivation of White button mushroom, oyster mushroom and paddy straw mushroom. **Mushroom recipes:** Creamy mushroom soup, mushroom souffle, mushroom pulao, stuffed mushroom, mushroom samosa and mushroom pickles. **S**ymptoms and treatment of mushroom allergy.

Recommended Texts

1. Pandey, R.K. and Ghosh, S.K. 1999. A handbook on mushroom cultivation. Emkay Publications, Delhi.
2. Pathak, V.N., Nagendra Yadav and Maneesha Gaur. 2000. Mushroom Production and Processing technology. Agrobios, Jodhpur.
3. Nita Bahl. 1988. Handbook on Mushroom. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi

Reference Books

1. Handbook of Mushroom Cultivation. 1999. TNAU publication.
2. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan. R. 1991. Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3. Swaminathan, M. 1990. Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
4. Nita Bahl. 2002. Handbook on Mushroom 4th edition Vijayprimlani for oxford and IBH publishing co., Pvt., Ltd., New Delhi.
5. Dr. C. Sebastian Rajesekaran Reader in Botany Bishop Heber College, Trichy – 17.
6. Suman. 2005. Mushroom Cultivation Processing and Uses, M/s. IBD Publishers and Distributors, New Delhi.

7. Sing. 2005. Modern Mushroom Cultivation, International Book Distributors, Dehradun.
8. Verma,2013. Mushroom: edible and medicinal: cultivation conservation, strain improvement with their marketing. Daya Publishing House.

Web resources

1. https://www.amazon.in/Mushroom-Cultivation-India-B-C/dp/817035479X
2. http://nrcmushroom.org/book-cultivation-merged.pdf
3. http://agricoop.nic.in/sites/default/files/ICAR_8.pdf
4. http://www.agrimoon.com/mushroom-culture-horticulture-icar-pdf-book/
5. https://books.google.co.in/books/about/Mushroom_Cultivation_in_India.html?id=6AJx99OGTKEC&redir_esc=y

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	2	3	3	2	3	3
CO 2	3	2	2	3	3	3	3	2	1	2
CO 3	3	1	3	2	1	3	3	2	3	2
CO 4	3	2	2	3	2	2	2	1	2	3
CO 5	2	2	3	3	2	2	3	2	1	2
Avg	2.8	1.8	2.6	2.8	2	2.6	2.8	1.8	2	2.4

S-Strong (3) M-Medium (2) L-Low(1)

Semester II			
SKILL ENHANCEMENT COURSE III - HERBAL MEDICINE			
Course Code: 23UBOSE3	**Hrs/ Week:2**	**Hrs/ Semester:30**	**Credits:2**

OBJECTIVES

1. To understand the nuances of medicinal plants and their phytoconstituents of commercial value
2. To know the value of Indian system of medicine,
3. To know the pharmacological importance of medicinal plants.
4. To develop the skill to prepare value added products using herbs.
5. To be aware of adulteration of herbal products.

COURSE OUTCOMES

CO	On completion of this course, the students will be able to:	PO
CO1	recall definitions, classifications, the botanical names and families of the crude drugs, the types of plant poisons and understand the general actions of poisons on the human body, the basic ingredients and their proportions for preparing herbal products and the herbal remedies commonly used.	**K1**
CO2	describe the key principles and foundations of indigenous systems of medicine, the significance of using specific plant parts for medicinal purposes, the principles and methods of detecting adulteration in crude drugs, formulation and the role of each ingredient in the preparation of herbal products.	**K2**
CO3	apply the knowledge of crude drug classification and botanical identification to identify and categorize crude drugs, select appropriate ingredients for specific herbal products and apply knowledge of herbal remedies for common diseases and techniques for detecting adulteration in crude drugs	**K3**
CO4	analyze the contributions of different cultures to the development of pharmacognostic knowledge, the therapeutic properties of crude drugs, the factors contributing to the toxicity of specific poisonous plants and the safety and potential side effects of herbal remedies	**K4**
CO5	assess the role of traditional indian systems, the potential associated with the medicinal uses of crude drugs, the export values of medicinal plants. the effectiveness of herbal products and develop personalized herbal remedy recommendations for specific health conditions	**K5, K6**

Semester II			
SKILL ENHANCEMENT COURSE III - HERBAL MEDICINE			
Course Code: 23UBOSE3	**Hrs/Week:2**	**Hrs/Semester:30**	**Credits:2**

UNITI History, definition and scope of pharmacognosy. Indian system of medicines: Siddha, Ayurvedha and Unani. Crude drugs: Definition and classification of crude drugs (morphological, taxonomic, therapeutic and chemical).

UNIT II Botanical name, family, useful part and medicinal uses of Root drugs:*Rauwolfia serpentina, Asparagus racemosus, Vetiveria zizananoides*. Rhizomes: *Zingiber officinale, Curcuma longa, Acorus calamus*. Woods: *Santalum album, Azadirachta indica, Pterocarpus santalinus.* Bark:*Terminalia arjuna, Saraca asoca, Cinnamomum zeylanicum.*

UNIT III Botanical name, family, useful part and medicinal uses of leaves:*Aloe vera, Justicia adhatoda, Ocimum tenuiflorum*. Flowers: *Syzygiumaromaticum, Crocus sativus, Hibiscus rosa-sinenesis.*Fruits: *Coriandrum sativum, Phyllanthus emblica, Piper nigrum*. Seed:*Elettaria cardamomum,Trigonella foenum-graecum, Terminalia chebula.* Entire plant:*Phyllanthus amarus, Bacopa monnieri, Catharanthus roseus.*

UNIT IV Poisonous plants: Types of plant poison, action of poisons, treatment for poisons, some poisonous plants and their toxicity and action. Adulteration of crude drugs and its detection, methods of adulteration. Medicinal plants of export values. Medicinal uses of non-flowering plants.

UNIT V Preparation of herbal products: bath powder, toothpowder, shampoo, rose water, tea, cough syrup. Herbal remedies for common diseases: cold, fever, constipation.

Recommended Texts

1. Roseline, A. 2011. Pharmacognosy. MJP Publishers, Chennai.
2. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. 2004. A Text Book of Pharmacognosy. Nirali Prakashan, Pune.
3. John Jothi Prakasj, E. 2001. Medicinal and Aromatic Plants. JPR Publication,Vallioor.
4. Kumar, N.C. 2004. An Introduction to Medical Botany and Pharmacognosy. Emkay Publication, New Delhi.
5. Singh, M.P., Oraon, B.C and Narendra Prasad. 2009. APH Publishing Corporation, New Delhi.

Reference books

1. Agarwal,O.P. 1985, Vol. II, Chemistry of organic – natural products. S Chand and Company, New Delhi.
2. Chopra, R.N., Badhuvar R.L and Gosh, G. 1965. Poisonous plants in India.
3. Chopra, R.N., Chopra, I.C., Handa, K.L., and Kapur L.D., 1994, Indigenous drugs of India.
4. Chopra, R.N., Nagar S.L., and Chopra, I.C. 1956, Glossary of Indian Medicinal Plants.
5. Jains, S.K.. 1996. Medicinal Plants. Deep Publications, New Delhi.
6. Miller, L and Miller, B. 2017. Ayurveda and Aromatherapy: The Earth Essential Guide to Ancient Wisdom and Modern Healing. Motilal Banarsidass, Fourth edition.
7. Nair, N.C and Henrry, A.N. 1983, Flora of Tamil Nadu, India, Botanical Survey of India.
8. Patri, F and Silano, V. 2002. Plants in cosmetics: Plants and plant preparations used as ingredients for cosmetic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.
9. Somasundaram, S. 1997. Medicinal botany (MaruthuvarThavaraviyal) – (Tamil Medium Book).

10. Srivastava, A.K. 2006, Medicinal Plants, International Book Distributors, Dehradun.
11. Wallis, T.E. 1967. Text Books of Pharmacognosy. J. and A. Churchill Ltd., London,

Web Resources

1. https://www.barnesandnoble.com/b/free-ebooks/nook-books/alternative-medicine-natural-healing/herbal-medicine/_/N-ry0Z8qaZ11iu
2. https://www.springer.com/gp/book/9783540791157
3. https://www.gpatonline.com/gpat/book-reference-pharmacognosy
4. https://www.researchgate.net/publication/334670695_Book_review-Herbal_Drug_Technology
5. http://www.eurekaselect.com/node/173492/herbal-medicine-back-to-the-future

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	3	1	3	2	2	1
CO2	3	2	2	2	3	2	3	2	2	1
CO3	2	1	2	3	3	2	3	2	2	1
CO4	3	2	2	3	2	1	3	3	2	2
CO5	2	2	3	1	3	1	2	3	3	2
Avg	2.6	1.6	2.2	2	2.8	1.4	2.8	2.4	2.2	1.4

S-Strong (3) M-Medium (2) L-Low(1)

SEMESTER – III			
Part-I Tamil Paper - 3 காப்பிய இலக்கியங்கள் **செய்யுள், இலக்கணம், இலக்கிய வரலாறு, புதினம்**			
23ULTA31	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	நம் தாய்மொழியில் உள்ள அரிய பொக்கிசங்களான காப்பியங்களை, அவற்றின் உட்கருத்தை மாணவியர் அறிந்துகொள்வர்.
2	சங்ககாலம் முதல் இக்காலம் வரை பல்வேறு சமயங்களின் வளர்ச்சி நிலைகள் பற்றியும் இக்காப்பியங்கள் வழி அறிந்து கொள்வர்.
3	வாழ்வுக்கு இலக்கணம் கூறும் அகப்பொருள் இலக்கணம் பற்றி அறிந்து கொள்வர்.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	**இப்பாடத்திட்டம் - மாணவியரிடம்**	**அறிவாற்றல் திறன்**
CO-1	இலக்கிய அறிவையும், காப்பிய அறிமுகம் மற்றும் கருத்து நலம் குறித்த புலமையை வளர்க்கிறது	K1
CO-2	கடல் போன்ற தமிழ் இலக்கியக் கனிச் சாற்றை மேன்மேலும் பருக வேண்டும் என்னும் ஆவலை வளர்க்கிறது.	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறனையும், படைப்பாற்றலையும் வளர்க்கிறது.	K3
CO-4	சங்க கால மக்களின் வாழ்க்கைச் சுவடு, மற்றும் வாழ்வியல் பண்பாட்டு நெறிகளின் தாக்கம் பெற்றுத் தங்களின் எதிர்கால வாழ்வைச் செம்மையுடன் அமைக்கும் திறனைப் பெறுகிறார்கள்.	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொண்டு வெற்றியோடு பயணிக்கும் திறனைப் பெறுகிறார்கள்.	K5

அலகு 1 **(18 மணி நேரம்)**

பெருங்காப்பியங்கள்

1. சிலப்பதிகாரம் - வழக்குரைகாதை - இளங்கோவடிகள்
2. மணிமேகலை – ஆதிரை பிச்சையிட்ட காதை – சீத்தலைச் சாத்தனார்
3. சீவக சிந்தாமணி – பூமகள் இலம்பகம் - திருத்தக்கத்தேவர்
4. வளையாபதி – நாதகுத்தனார்

அலகு – 2 **(18 மணி நேரம்)**

சமய காப்பியங்கள்

1. பெரியபுராணம் - பூசலார் நாயனார் புராணம் - சேக்கிழார்
2. கம்பராமாயணம் - மந்தரை சூழ்ச்சிப் படலம் - கம்பர்
3. இயேசு காவியம் - மலைப் பொழிவு – கண்ணதாசன்
4. சீறாப்புராணம் - புலி வசனித்த படலம் - உமறுப் புலவர்

அலகு – 3 **(18 மணி நேரம்)**

இலக்கணம்

1. **அகப்பொருள்:**
   1. ஏழு திணை விளக்கம்
   2. முதல், கரு, உரிப் பொருள் - விளக்கம்
2. **புறப்பொருள்:**
   1. வெட்சி முதல் பாடாண் திணை வரை - விளக்கம
3. **யாப்பின் இலக்கணம்**

அலகு – 4 **(18 மணி நேரம்)**

இலக்கிய வரலாறு

1. ஐம்பெருங் காப்பியங்கள்
2. ஐஞ்சிறு காப்பியங்கள்
3. சிற்றிலக்கியங்கள்

அலகு – 5 **(18 மணி நேரம்)**

புதினம்

1. வஞ்சிமாநகரம் (வரலாற்றுப் புதினம்) – நா.பார்த்த சாரதி

துணைநின்ற நூல்கள்

1. சிலப்பதிகாரம் - புலவர் பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.
2. மணிமேகலை - புலவர் பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.
3. .சீவகசிந்தாமணி - புலவர் பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

4. கம்பராமயணம் - பேரா. பூவண்ணன்(உரையாசிரியர்)
வர்த்தமானன் பதிப்பகம்
21, இராமகிரு‘ணா தெரு
தியாகராய நகர்
சென்னை – 17.
5. பெரியபுராணம் - பன்னிரு திருமுறைகள்
ச.வே.சுப்பிரமணியன்
மணிவாசகர் பதிப்பகம்
31, சிங்கர் தெரு
பாரிமுனை, சென்னை – 18.

6. இயேசு காவியம் - கவிஞர் கண்ணதாசன்,
கண்ணதாசன் பதிப்பகம்
கலைக்காவிரி வெளியீடு,
திருச்சி .
7. ஐஞ்சிறுகாப்பியங்கள் (மூலமும் உரையும்) – தமிழ் நிலையம்
40, சரோஜினி தெரு
தியாகராய நகர்
சென்னை – 17
8. புறப்பொருள் வெண்பாமாலை - பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
திருநெல்வேலி தென்னிந்திய
சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
திருநெல்வேலி – 6.

பார்வை நூல்கள்

1. தொல்காப்பியம் - பொருளியல் உரைவளம் - க. வெள்ளைவாரணன்
பதிப்:புத் துறை,
மதுரை காமராசர் பல்கலைக் கழகம்,
மதுரை- 625 021.
முதற்பதிப்பு - 1983

7. நன்னூல் - பவணந்தி முனிவர்
திருநெல்வேலி தென்னிந்திய
சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
திருநெல்வேலி – 6.

8. தமிழ் இலக்கிய வரலாறு - தமிழ்த்துறை தொகுப்பு
தூய மரியன்னை கல்லூரி (தன்னாட்சி), தூத்துக்குடி.

இணைய ஆதாரங்கள்

1. Project Madurai - www.projectmadurai.org

2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>
3. Tamil Books on Line – books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	**<40%**	**≥ 40%and<70%**	**≥70%**
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – III			
Part I French	**French Literature and Grammar I**		
Course Code: 23ULFA31/ 23ULFB31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- To get a gist of the French Literature.
- To appreciate the essence in the literary texts
- To develop an interest in the French literature that will encourage her to pursue higher studies in French.
- To identify the grammar used in the literary texts and advance into complicated grammar.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	comprehend the history of the French literature.	K1
CO-2	interpret the values and morals through literary texts.	K2
CO-3	imbibe the basic grammatical structures of the French language	K3
CO-4	compare literary texts of different centuries to note the difference in writings.	K4
CO-5	estimate the humanistic value about author's ideas and transform her own personality	K5

SEMESTER – III			
Part I French	**French Literature and Grammar I**		
Course Code: 23ULFA31/ 23ULFB31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Moyen Age

1.1 – Estula - Auteur Anonyme
1.2 – Balade des pendues – François Villon
1.3 – Les pronoms COD et COI

Unit II – XVI^{e} siècle

2.1 – Regrets - Joachim du Bellay
2.2 – Gargantua - François Rabelais
2.3 – Le futur proche/ Passe récent

Unit III – XVII^{e} siècle

3.1 - La cigale et la fourmi - Jean de la Fontaine
3.2 – Sur la mort de son fils - François de Malherbe
3.3 – Le passe compose avec avoir et être

Unit IV – Francophonie - Québec

4.1 – Une saison dans la vie d'Emmanuel - Marie Claire Blais
4.2 – L'imparfait
4.3 – Le passe compose et l'imparfait

Unit V – Francophonie – Afrique Noire

5.1 – L'enfant noir - Camara Laye
5.2 – L'impératif
5.3 – Le futur simple

Textbook:

- Textes complié par le département de français
- Clémence Fafa, Yves Loiseau, Violette Petitmengin, *Grammaire Essentielle Du Français A1*, Didier, 2018

Books, Journals and Learning Resources

- K. Madanagobalane, N.C.Mirakamal. *Le Francais par les Textes*. Chennai : Samhita Publications, 2019.
- Ludivine Glaud, Muriel Lannier, Yves Loiseau, *Grammaire Essentielle Du Français A1 A2*, Didier, 2015
- Blondeau Nicole, Allouache Ferroud jà, Ne Marie-Françoise. *Littérature Progressive du Français*. Paris : CLE International, 2004.
- Akyuz Anne, Bazelle-Shahmaei Bernadette, Bonenfant Joelle, Gliemann Marie-Francoise. *Les 500 exercices de grammaire*. Paris : Hachette livre, 2005
- Grégoire Maria. *Grammaire Progressive du français*. Paris : CLE International, 2002.
- Sirejols Evelyne, Tempesta Giovanna,Grammaire. *Le Nouvel Entrainez-vous avec 450 Nouveaux Exercices.* Paris : CLE International, 2002
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.conte-moi.net/node/120

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	1	3	2	2	1	2	3	3
CO-2	3	2	2	2	2	2	2	3	3	3
CO-3	3	3	1	2	2	3	3	2	2	3
CO-4	3	3	2	2	1	1	2	2	3	3
CO-5	2	1	2	3	3	1	2	3	3	3
Ave.	2.8	2.2	1.6	2.4	2	1.8	2	2.4	2.8	3

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER – III			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - III**		
Course Code: 23UGEN31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Objectives:

- To enable the learners, experience the literary works.
- To use English effectively for study purpose across the curriculum.
- To develop interest in the appreciation of Literature.
- To develop and integrate the use of LSRW skills.

Course Outcomes:

CO. No.	Upon completion of the course, the students will be able to	PSO Addressed	K Level
CO -1	identify the central themes of the literary texts.	1,3	1
CO - 2	express the correct usage of English Grammar in writing and speaking.	2,3	2
CO - 3	show their reading fluency skills through extensive reading.	2,3	3
CO - 4	analyse and appreciate literary works.	3,4	4
CO - 5	evaluate and integrate the use of the four language skills.	5	5

SEMESTER - III			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - III**		
Course Code: 24UGEN31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Poem

William Wordsworth (1770- 1850) : The Stolen Boat
William Blake (1757- 1827) : Auguries of
Innocence Rabindranath Tagore (1861-1941) : Fairyland
W.H. Davies (1871-1940) : Leisure

Unit II – Prose

A.G. Gardiner (1865- 1946) : On Cats and Dogs
Wangari Maathaai (1940 – 2011) : Nobel Prize Acceptance Speech

Unit III – Short Story

Leo Tolstoy (1828 – 1910) : How Much Land Does a Man Need
O' Henry (1862- 1910) : The Gift of the Magi
Washington Irving (1783 – 1859) : Rip Van Wrinkle

Unit IV – Grammar

Phrasal Verbs &
Idioms Modals and
Auxiliaries
Verb Phrases – Gerund, Participle and Infinitives

Unit V – Composition / Writing Skills

Brochures for Programmes and Events (Drafting Invitations)
Official Correspondence – Leave Letter, Letter of Application & Permission Letter

Text Books (Latest Editions)

1.Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.
2. Green, David. *Contemporary English Grammar Structures and Composition*. 2nd Edition. Bengaluru: Trinity Press, 1971.

Web Resources

WangariMaathai – Nobel Lecture. Nobel Prize Outreach AB 2023. Jul 2023. https://www.thoughtco.com/usage-grammar-1692575
https://grammar.yourdictionary.com/

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	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	3	2	3	2	3	2	2
CO-2	2	3	3	3	3	2	3	2	2	3
CO-3	3	3	3	3	3	3	3	2	2	3
CO-4	2	3	3	3	2	2	3	3	2	2
CO-5	3	3	3	2	2	3	3	3	3	2
Ave.	2.6	2.8	3	2.8	2.4	2.6	2.8	2.6	2.2	2.4

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER III			
CORE III - BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS			
Course Code: 23UBOC31	**Hrs / Week: 5**	**Hrs / Semester: 75**	**Credits: 5**

COURSE OBJECTIVE

To acquire knowledge about the classification, distinguishing traits, geographic distribution, reproductive cycle, ecological and economic significance of bryophytes, pteridophytes and gymnosperms.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the classification and economic importance of bryophytes, pteridophytes and gymnosperms.	K1
CO2	distinguish life cycle patterns in bryophytes, pteridophytes and gymnosperms.	K2
CO3	apply the knowledge acquired for self-employability based on the economic significance of bryophytes, pteridophytes and gymnosperms.	K3
CO4	compare and contrast the modes of reproduction in diverse groups of plant forms.	K4
CO5	conclude and analyze the evolutionary status of bryophytes pteridophytes and gymnosperms.	K5

SEMESTER III			
CORE III - BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS			
Course Code: 23UBOC31	**Hrs / Week: 5**	**Hrs / Semester: 75**	**Credits: 5**

UNIT I **Bryophytes:** General characteristic, amphibians of plant kingdom with evidences, Classification of Bryophytes by Rothmaler (1951) (up to order level), Spore dispersal mechanisms and spore germination patterns in bryophytes. Structure, reproduction and life cycles of *Riccia, Marchantia* and *Sphagnum.* Ecological and economic importance of bryophytes.

UNIT II **Pteridophytes**: General characteristics, resemblance with bryophytes, Classification by Smith (1955) (up to order level), Reproduction, Alternation of generation in life cycle, Abnormalities in life cycle (apogamy and apospory), Stelar evolution, Heterospory and seed habit, Economic importance of pteridophytes.

UNIT III Systematic position**,** Morphology, Anatomy, Reproduction and Life-cycle of *Psilotum, Lycopodium* and *Selaginella.* (Developmental details not required). Fossil pteridophyte – *Rhynia*.

UNIT IV **Gymnosperms:** General characteristics, Affinities with pteridophytes and angiosperms. Classification of gymnosperms (Sporne, 1965) (up to family). Economic importance of g**y**mnosperms. Fossil gymnosperm- *Lyginopteris* - constructed plant parts.

UNIT V Systematic position, Morphology, Anatomy, Reproduction and Life cycle of *Cycas*, *Pinus* and *Gnetum* (Developmental details not required).

Textbooks

1. Johri, R. M., Sneh, L., and Tyagi, K. (2012). *A Textbook of Bryophyta*. New Delhi: Dominant Publishers and Distributors Pvt. Ltd.
2. Johri, R. M., Lata, S., and Sharma, S. (2012). *A Textbook of Pteridophyta*. New Delhi: Wisdom Press.
3. Sharma, O. P. (2014). *Bryophyta*. McGraw Hill. ISBN: 9781259062872.
4. Vashista, P. C. (1976). *Gymnosperms*. New Delhi: S. Chand and Co
5. Yadav, R. S. (2019). *Textbook of Pteridophytes*. New Delhi: Seva Books.

Books for Reference

1. Kumar, A. (2006). *Gymnosperms*. New Delhi: S. Chand and Company Private Limited.
2. Bhatnagar, S. P., and Moitra, A. (2013). *Gymnosperms*. New Delhi: New Age International Private Limited.
3. Biswas, C., and Johri, B. M. (1997). *The Gymnosperms*. New York: Springer-Verlag Berlin Heidelberg.
4. Gupta, M. N. (1972). *The Gymnosperms* (2nd ed.). Agra: Shiva Lal Agarwala and Co.
5. Sporne, K. R. (1991). The Morphology of Gymnosperms. New Delhi: B.I. Publications.
6. Vashishta, B. R., Sinha, A. K., and Singh, V. P. (2006). *Bryophyta*. New Delhi: S. Chand and Co. Ltd.
7. Vashishta, B. R., Sinha, A. K., and Kumar, A. (2022). Botany for Degree Students: Bryophytes. New Delhi: S. Chand Publishing.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	2	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	2	3	3	2	2
CO5	3	3	3	3	2	3	2	3	3	3
Avg	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

S-Strong (3) M-Medium (2) L-Low (1)

SEMESTER III			
CORE PRACTICAL III - BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS PRACTICAL			
Course Code: 23UBOCR3	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To acquire knowledge through the identification of the morphology and anatomy of bryophytes, pteridophytes, and gymnosperms and to develop technical skills in the sectioning and characterization of these plant groups.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the basic characteristic features and distinguish their morphological identification of bryophytes, pteridophytes and gymnosperms	K1
CO2	explain the structure of bryophytes pteridophytes and gymnosperms.	K2
CO3	apply the knowledge acquired for identification of different plant groups.	K3
CO4	analyse the importance of structural variability in the evolution of plant forms.	K4
CO5	evaluate the techniques to identify the different plant forms.	K5

SEMESTER III			
CORE PRACTICAL III - BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS PRACTICAL			
Course Code: 23UBOCR3	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

Morphology and Anatomy of the following living forms

Bryophytes:

- *Riccia:* Habit

  Section - T.S of Thallus

  Permanent slide – T.S. of thallus through mature sporangium.

- *Marchantia*: Habit

  Section: rhizoids, scales, V.S. thallus through gemma cup,

  Permanent slides - V.S. of antheridiophore, archegoniophore, L.S. of sporophyte.

- *Sphagnum:* Habit

  Section: T.S of stem

  Permanent slides – V.S. of atheridium, V.S of archegonia.

Pteridophytes:

- *Psilotum: Habit*

  Section*:* rhizome, leaf, aerial axis

  Permanent slides: sporangia

- *Lycopodium*: Habit, cone (entire)

  Section: stem

  Permanent slide: L.S of cone

- *Selaginella*: Habit, cone (entire)

  Section: rhizophore and stem

  Permanent slides: L.S of cone

- Fossil Pteridophyte – *Rhynia*

Gymnosperms:

- *Cycas* – Habit, male cone (entire), L.S. of male cone, megasporophyll,

  Section - T.S. of coralloid root, rachis and leaflet.

Permanent slides: T.S. of stem, L.S. of microsporophyll,

- *Pinus* - Twig, dwarf shoot.

  Section - T.S. of young stem and needle

  Permanent slides: T.S. of old stem, L.S. of young and mature male, female cone, seed entire.

- *Gnetum* – Twig.

  Section – T.S. of stem and leaf, wood showing anomalous secondary thickening

  Permanent slides: L.S. of male and female inflorescence, seed entire

- Fossil gymnosperm – *Lyginopteris*

Submission: Record note book

Field Visit

Reference

1. Bendre Kumar. (2014). *A Textbook of Practical Botany, Volume I and II* (7th ed.). Rastogi Publications.
2. Srivastava, H. N. (1987). *Practical Botany, Volume I*. Pradeep Publications.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	2	3	3	2	2
CO5	3	3	3	3	2	3	2	3	3	3
Avg	3	2.8	2.8	3	2.8	2.8	2.8	3	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER- III			
Generic Elective III	**Chemistry For Biological Sciences - I**		
Code: 23UCHE32	**Hrs./Week: 4**	**Hrs/Sem: 60**	**Credits: 3**

Objectives

This course aims at providing knowledge on

- Basics of atomic orbitals, chemical bonds, hybridization and fundamentals of organic chemistry
- Nuclear chemistry and industrial chemistry
- Importance of specialty drugs and separation and purification techniques.

Course Outcome

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain in-depth knowledge about the nuclear reactions, fuels, hybridization, drugs and chromatographic techniques.	K1
CO-2	evaluate the theories of chemical bonding, efficiencies of fertilizers, mechanism involved in the organic reactions, the structure of antibiotics, anesthetics, antipyretics and artificial sugars, and separation techniques.	K2
CO-3	explain the nuclear chemistry, silicones, electronic effect uses of drugs and analytical techniques.	K3
CO-4	apply carbon and rock dating, gaseous fuels, Heterocyclic compounds, uses of antibiotics, anesthetics, antipyretics and artificial sugars and purification techniques.	K4
CO-5	evaluate molecular orbital diagram, role of fertilizers, types of reactions, the effect of drugs, various methods to identify an appropriate method for the separation of chemical components.	K5

UNIT I Chemical Bonding and Nuclear Chemistry

Chemical Bonding: Molecular Orbital Theory-bonding- antibonding and non-bonding orbitals. M. O diagrams for Hydrogen- Helium- Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental of subatomic particles - Isotopes- Isobars- Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating- rock dating and medicinal applications. Major nuclear reactors in India- Nuclear Hazards disposal of radioactive waste and safety measures.

Unit II Industrial Chemistry

Fuels: Fuel gases: Natural gas- water gas- semi water gas- carbureted water gas- producer gas- CNG- LPG -oil gas (manufacturing details not required).

Silicones: Synthesis- properties and uses of silicones.

Fertilizers: Urea- ammonium sulphate- potassium nitrate- NPK fertilizer- superphosphate- triple superphosphate.

UNIT III Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Polar effects: Inductive effect and consequences on Ka and K_b of organic acids and bases- electromeric- mesomeric- hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration- halogenation- Friedel-Craft's alkylation and acylation.

Heterocyclic compounds-classification with examples.

UNIT IV Drugs and Specialty Chemicals

Definition- structure and uses: Antibiotics- Penicillin-Chloramphenicol and Streptomycin- Anesthetics Chloroform and ether-Antipyretics -aspirin- paracetamol and ibuprofen

Artificial Sweeteners – saccharin-Aspartame and cyclamate

Organic Halogen compounds – Freon-Teflon.

UNIT V Analytical Chemistry

Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction- distillation and crystallization. Chromatography: principle and application of column- paper and thin layer chromatography.

Recommended Text

1. V. Veeraiyan, Textbook of Ancillary Chemistry; High mount Publishing house, Chennai, first edition, 2009.
2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. Arun Bahl, B. S. Bahl, Advanced Organic Chemistry; S. Chand and Company, New Delhi, twenty third edition, 2012.
4. P. L. Soni, H. M. Chawla, Text Book of Inorganic Chemistry; Sultan Chand & sons,
5. New Delhi, twenty ninth edition, 2007.

Reference Books

1. P. L. Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.K. Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	1	1	2	1	3	2	3	2	1
CO-2	1	3	2	2	2	2	3	3	1	1
CO-3	3	1	1	2	2	3	2	3	2	3
CO-4	3	3	2	2	2	1	3	3	2	2
CO-5	1	3	3	3	1	3	1	3	2	3
Ave.	2.2	2.2	1.8	2.2	1.6	2.4	2.1	3	1.8	2.0

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER- III			
Generic Elective Practical I	**Chemistry Practical I**		
Code :23UCHER1	**Hrs./Week:2**	**Hrs/ Sem: 30**	**Credits:1**

Objectives

This course aims to provide knowledge on the

- Basics of preparation of solutions.
- Principles and practical experience of volumetric analysis

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain an understanding of the use of standard flask and volumetric pipettes, burette.	K1
CO-2	design, carry out, record and interpret the results of volumetric titration.	K2
CO-3	apply their skill and identify the end point of various titrations.	K3
CO-4	analyze the chemical constituents in allied chemical products	K4
CO-5	estimate the concentration of given solution.	K5

VOLUMETRIC ANALYSIS

1.Estimation of sodium hydroxide using standard sodium carbonate.

2.Estimation of hydrochloric acid using standard oxalic acid.

3.Estimation of ferrous sulphate using standard Mohr's salt.

4.Estimation of oxalic acid using standard ferrous sulphate.

5.Estimation of potassium permanganate using standard sodium hydroxide.

6.Estimation of magnesium using EDTA.

7.Estimation of ferrous ion using diphenyl amine as indicator

Reference Books

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
Ave.	3	3	3	3	3	3	3	3	3	3

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER III			
NME I - HERBAL HEALTH CARE PRODUCTS			
Course Code: 23UBON31	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To provide knowledge of the basic skills in the preparation of herbal products and create awareness on utilization of herbal drugs

COURSE OUTCOMES

CO. No.	On completion of this course, the students will be able to:	PO
CO1	acquire the fundamentals of herbal therapies and the safety considerations associated with herbal medications.	**K1**
CO2	understand the specific uses, botanical characteristics, and therapeutic properties of plants used for health care.	**K2**
CO3	apply knowledge of botany and herbal medicine to produce health care products	**K3**
CO4	analyze the herbal components used in health care and their traditional uses	**K4**
CO5	combine information on various plants used for health care to create home remedies	**K5**

SEMESTER III			
NME I - HERBAL HEALTH CARE PRODUCTS			
Course Code: 23UBON31	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

UNIT I **Herbal drug:** Definition; Importance of Herbal therapies, Herbal verses conventional drugs, Safety in herbal drugs. Hair care: Botanical name, common name, useful part, family and uses of *Cocos nucifera, Eclipta alba, Acacia concinna, Phyllanthus emblica, Lawsonia inermis* and *Hibiscus rosa-sinensis*.

Preparation of hair oil.

UNIT II **Skin care:** Botanical name, common name, useful part, family and uses of *Aloe vera, Curcuma aromatica, Curcuma zedoaria, Trigonella foenum-graecum, Citrus limon, Acorus calamus* and *Rosa indica*

Preparation of bathing powder.

UNIT III **Dental care:** Botanical name, common name, useful part, family and uses of *Azadirachta indica, Syzygium aromaticum, Eucalyptus globulus, Mentha piperita, Psidium guajava* and *Allium sativum* .

Preparation of tooth powder.

UNIT IV **Eve care:** Botanical name, common name, useful part, family and uses of *Ficus religiosa, Aegle marmelos, Achyranthes aspera, Saraca asoca, Asparagus racemosus* and *Boerhaavia diffusa*

Preparation of uterine decoction.

UNIT V **Pulmonary care**: Botanical name, common name, useful part, family and uses of *Zingiber officinale, Piper nigrum, Piper longum, Cinnamomum zeylanicum, Elettaria cardamomum* and *Ocimum tenuiflorum*

Preparation of cold cure powder and pain balm.

Text book

1. John Jothi Prakash, E. (2001). *Medicinal and Aromatic Plants*. Vallioor, India: JPR Publication.

Books for Reference

1. Gokhale, S.B., Kokate, C.K., and Purohit, A.P. (2004). *A Text Book of Pharmacognosy*. Pune: Nirali Prakashan.
2. Kumar, N.C. (2004). *An Introduction to Medical Botany and Pharmacognosy*. New Delhi: Emkay Publication.
3. Roseline, A. (2011). *Pharmacognosy*. Chennai: MJP Publishers.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	2	3	3	2	3	2	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	2
Avg	2.8	2.8	3	2.8	3	2.8	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER III			
SKILL ENHANCEMENT COURSE IV - PLANT PROPAGATION TECHNIQUES PRACTICAL			
Course Code: 23UBOSE4	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To attain skill in plant propagation techniques and to understand the different methods propagation techniques

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the basic concept of propagation techniques	K1
CO2	explain various plant propagation structures and their utilization.	K2
CO3	demonstrate skills related to vegetative plant propagation techniques such as cuttings, layering, grafting and budding.	K3
CO4	compare and contrast the vegetative and Asexual propagation.	K4
CO5	recommend a specific propagation technique for a given plant species.	K5

SEMESTER III			
SKILL ENHANCEMENT COURSE IV - PLANT PROPAGATION TECHNIQUES PRACTICAL			
Course Code: 23UBOSE4	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

UNIT I **Basic concepts of propagation:** Definition, need and potentialities for plant multiplication; asexual and sexual methods of propagation - advantages and disadvantages. Propagation facilities: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds and poly-houses.

UNIT II **Propagation by cuttings:** Definition, different methods of cuttings; root, stem and leaf cuttings. Stem cuttings: Definition of stem tip and section cuttings; plant propagation by herbaceous, soft wood, semi hard wood and hard wood. Factors influencing rooting of cuttings; Use of plant growth regulators in rooting of cuttings.

UNIT III **Propagation by layering:** Definition, principle and factors influencing layering. Layering: Ground layering – tip layering, simple layering, trench layering, mound (stool) layering and compound (serpentine layering). Application of Air layering technique in woody trees.

UNIT IV **Propagation by grafting and budding:** Definition, principle, types, graft incompatibility, collection of scion wood stick, scion stock relationship, and their influences, bud wood certification; micrografting. Propagation by veneer, whip, cleft, side and bark grafting techniques. **Budding:** Definition; techniques of 'T', inverted 'T', patch and chip budding.

UNIT V **Propagation by Seeds:** Definition, harvesting and processing of seeds, seed testing**,** seed treatment to improve germination, seed storage, primary and secondary seed dormancy and seedling production.

Text Book

1. Kumar, N. 1997**.** *Introduction to Horticulture*. Nagercoil, India: Rajalakshmi Publications.

Books for Reference

1. Edmund Senn, Andrew, Halfacre. 1977. *Fundamentals of Horticulture*. Tata Mc. Graw Hill.
2. Hartmann and Kester, 1989. *Plant propagation*. New Delhi: Prentice-Hall of India.
3. Hudson.T. Hartmann, Dale. E. Kester. Fred, T. Davis Jr. Robert Geneve. 2002. *Plant Propagation.* New Delhi: Jay Pack Private limited. New Delhi.
4. Kumar, N. 1997**.** *Introduction to Horticulture*. Nagercoil, India: Rajalakshmi Publications.
5. Mallikarjuna Reddy and Aparna rao 2010. *Plant propagation in horticulture*. New Delhi: Pacific book international.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2	3	3	2	3	2
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3
Avg	2.8	2.8	2.8	3	2.6	2.8	2.8	2.8	3	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER –III			
Ability Enhancement Course	**Yoga and Meditation**		
Course Code: 23UAYM31	**Hrs/Week: 1**	**Hrs/Semester: 15**	**Credits: 1**

Objectives

This course aims at providing knowledge on

- self -awareness and concentration.
- yoga and benefits of yoga asanas.
- the power of positive attitude.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Acquire knowledge in Meditation, awareness, different types of yoga mindfulness and attitude to life.	K1
CO-2	Gain knowledge on Major types of meditation, self-awareness, basic asanas and three components of mindfulness, positive and negative attitude.	K2
CO-3	Explain health benefits of meditation, concentration, asanas for healthy life, mindfulness and Brainwave patterns, heartfullness	K3
CO-4	Understand better meditation, levels of concentration, surya namaskar, Myths about mindfulness, feat and its types.	K4
CO-5	Evaluate the psychological benefits of meditation, ways to develop Presence, benefits of doing in regular life, Scientific Facts about Mindfulness and anger styles.	K5

Unit I Meditation

Meditation — Major types of meditations: Zazen, Mindfulness, Vipasana, Yoga, Self-inquiry, Listening, – Health benefits of meditation: physical, psychological, spiritual–Tips for better meditation. Exercises: Practicing Zazen meditation – Self-enquiry meditation exercises

Unit II Self-Awareness

Awareness – Self-awareness – Importance of self-awareness –Difference between Awareness and Concentration – Power of concentration – Levels of concentration – How to increase concentration? – Ways to develop your presence

Exercises: Body Scan exercise

Unit III Yoga

Different types of yoga- Pranayama – Surya namaskara– Basic asanas for healthy life- Pranam asana, Hasta Uttan Asana- Pada Hasta Asana- Adhomukha Svanasana - Danda Asana -Vajra Asana, Padmasana, Parvat Asana, Utthita Padasana, Navasana, Bujang Asana- Dhanur Asana- Savasana

Exercises: Practicing basic Asanas – Doing Sun Salutation

Unit IV Mindfulness

Definition of mindfulness – Three components of mindfulness– Mindfulness and Brainwave patterns – Myths about mindfulness – Scientific Facts about mindfulness – Formal and Informal methods method to practice mindfulness

Exercises: Practice Mindful Walking –Practice Mindful Talking

Unit V Heartfulness

Attitude to life – Power of positive attitude– Techniques to develop positive attitude– Positive vs negative people – Forms of negative attitude – Heartfulness – Managing fear: Basic 5 fears, way's to overcome fear–Handling anger: Anger styles, Tips to tame anger

Exercises: Practice Loving-Kindness meditation– Doing compassionate actions.

SEMESTER III	
SELF STUDY I - FOOD PROCESSING TECHNOLOGY	
Course Code: 23UBOSS1	**Credits: +2**

COURSE OBJECTIVE

To provide comprehensive knowledge and skills for the efficient and safe processing of food.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	find the taste, texture, flavor, composition, nutritional quality, appearance and related microbes of food products.	K1
CO2	explain the various methods of food preservation and their application, including canning, pasteurization, refrigeration, and controlled atmosphere storage.	K2
CO3	apply unit operations involved in food processing, such as mixing, separation, heat transfer, and mass transfer, to achieve specific processing goals.	K3
CO4	analyze and solve problems related to food processing, quality control, and product development.	K4
CO5	evaluate various food preservation methods, considering factors such as efficacy, impact on nutritional content, and suitability for different food products.	K5

SEMESTER III	
SELF STUDY I - FOOD PROCESSING TECHNOLOGY	
Course Code:23UBOSS1	**Credits: +2**

UNIT I **Food Preservation:** Principles of food preservation, biochemical composition of food, food spoilage, microbial flora of food. Methods of preservation: refrigeration, freezing, canning, drying, dehydration and chemical preservatives

UNIT II **Processing of fruits and vegetables**: Canning of fruits (mango, banana) Canning of vegetables (bean, carrot), Drying of fruits (banana, dates, grapes, fig). Procedure for preparation of pickle (lemon), juice (Grape), squash (Pineapple), jam (mixed fruit jam), ketchup (Tomato). Containers for packing (tin and glass containers).

UNIT III **Processing of milk:** Biochemical composition of milk, microbial flora and spoilage of milk. Quality control test: Resazurin test and Methylene blue dye reduction test. Procedure for preparation of butter, ghee, ice-cream, paneer.

UNIT IV **Processing of bakery products**: Ingredients, equipments used and processes for making breads and cakes. Quality characteristics, faults and corrective measures product. Different types of icing.

UNIT V **Processing of millets**: Types of millets, nutrient content of millets, health benefits of millets, ways to incorporate millet into diet. processing of millets using hand pound method and machine method. Procedure for preparation of millet bread, millet roti, millet porridge and millet laddu.

Textbook

1. Raina, U., Kashyap, S., Narula, V. Thomas, S., Suvira, S. and Chopra, S. (2007). *Basic Food Preparation*-A complete Manual. Hyderabad: Orient Longman Pvt. Ltd., third edition.

Books for Reference

1. Dubey, S.C. (2007). *Basic Baking*. New Delhi: Chanakya Mudrak Pvt. Ltd., fifth edition.
2. Frazier, W.C., and West Holf, D.C. (1995). *Food Microbiology*. New Delhi: Tata Mc Graw Hill publishing Co. Ltd.
3. Kulshrestha, S.K. (1994). *Food preservation*. New Delhi: Vikas publishing House.
4. Srivastava, R.P. (1982). *Preservation of fruits and vegetable products*. Dehra Dun:Shailendra Rajan. Publisher.

5. Srivastava, R. P., and Kumar, S. (2002). *Fruit and Vegetable Preservation:* Principle and Practices. Lucknow: International Book Distributing Co.
6. Swaminathan, M. (1992). *Handbook of Food Science and Experimental foods*. Bangalore: the Bangalore printing and publishing Co. Ltd.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	2	3	3	2	3	2	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	2
Avg	2.8	2.8	3	2.8	3	2.8	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER – IV			
Part-I Tamil Paper - 4 சங்க இலக்கியங்கள் செய்யுள், இலக்கணம், இலக்கிய வரலாறு, நாடகம்			
Course Code 23ULTA41	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

நோக்கங்கள்

	Learning Objectives
1	சங்க இலக்கியத்தின் சிறப்பையும் நாடகம் என்னும் இலக்கிய வகையின் தன்மைமையையும், அகத்திணை புறத்திணை இலக்கணங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்
2	இலக்கியங்களின் சிறப்பினை உணர்த்துதல். சங்கம் வைத்துத் தமிழாய்ந்த மன்னர், புலவர், மக்கள் இவர்களின் வாழ்வியல் அறங்களைக் கண்டறிவர்.
3	மொழியைப் பிழையின்றி பேசவும் எழுதவும் பயன்படுகிறது. படைப்பாற்றல் திறனை வளர்க்க உதவுகிறது.
4	பழந்தமிழர் வாழ்வியல் முறைகளை கற்று பயனடைய உதவுகிறது பண்பாட்டுச் சிறப்பினை மொழியின் வழி அறிந்து தம் வாழ்வில் கடைப்பிடிக்க வழிகாட்டுகிறது.
5	தமிழ் இலக்கியம் சார்ந்த போட்டித்தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

பாடத்திட்டத்தின் பயன்கள்

CO.No.	**இப்பாடத்தைக் கற்பதால் மாணவிகள் பின்வரும் பயனை அடைவர்**	**Cognitive Level**
CO-1	சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர்	K1
CO-2	தமிழின் தொன்மையையும் செம்மொழித் தகுதியையும் அறிந்து கொள்ளுதல்	K2
CO-3	நாடக இலக்கியம் மூலம் நடிப்பாற்றலையும், கலைத்தன்மையையும், படைப்பாற்றலையும் வளர்த்தல்	K4
CO-4	பழந்தமிழர் வாழ்வியல் முறைகளை கற்று பயனடைய உதவுகிறது.	K4
CO-5	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்த்து வேலைவாய்ப்பினையும் பெறுவர்.	K5

அலகு – 1 **(18 மணி நேரம்)**

I. எட்டுத்தொகை

1. நற்றிணை – பாடல்கள் 10, 14, 16
2. குறுந்தொகை – பாடல்கள் 16, 17, 19, 20, 25, 29, 38, 440
3. கலித்தொகை – பாடல்கள் 38, 51
4. அகநானூறு - பாடல்கள் 15, 33
5. புறநானூறு - பாடல்கள் 37, 86, 112
6. பரிபாடல் - பாடல் - 55

அலகு – 2 **(18 மணி நேரம்)**

பத்துப்பாட்டு – நெடுநல்வாடை – நக்கீரர்

அலகு - 3 **(18 மணி நேரம்)**

இலக்கணம்

பா வகைகள்

1. ஆசிரியப்பா, வெண்பா பொது இலக்கணம்

அணி இலக்கணம்

1. உவமை அணி
2. உருவக அணி
3. வேற்றுமை அணி
4. வஞ்சப் புகழ்ச்சி அணி
5. சிலேடை அணி
6. தற்குறிப்பேற்றணி

அலகு - 4

இலக்கிய வரலாறு **(18 மணி நேரம்)**

1. எட்டுத்தொகை
2. பத்துப் பாட்டு
3. சங்க இலக்கியச் சிறப்பியல்புகள்

அலகு - 5 **(18 மணி நேரம்)**

நாடகம் : சபாபதி - பம்மல் சம்பந்த முதலியார்

துணை நின்ற நூல்கள்

1. பத்துப்பாட்டு - பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

2. எட்டுத்தொகை - பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

பார்வை நூல்கள்

1. நன்னூல் - பவணந்தி முனிவர்
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.
2. தமிழ் இலக்கிய வரலாறு - தமிழ்த்துறை தொகுப்பு
   தூய மரியன்னை கல்லூரி (தன்னாட்சி),
   தூத்துக்குடி.

3. பத்துப்பாட்டு - முனைவர் நாகராசன் (உரையாசிரியர்)
நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்
41, அம்பத்தூர்
சென்னை – 98.

4. பத்துப்பாட்டு - முனைவர் கு.வெ. பால சுப்பிரமணியன்(உரையாசிரியர்)
நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்
41, அம்பத்தூர்
சென்னை – 98.

இணைய ஆதாரங்கள்

1. Tamil Heritage Foundation- www.tamilheritage.org <http://www.tamilheritage.org>
2. Tamil virtual University Library- www.tamilvu.org/ library http://www.virtualvu.org/library
3. Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <http://www.chennailibrary.com>.
5. Tamil Universal Digital Library- www.ulib.prg <http://www.ulib.prg>.
6. Tamil E-Books Downloads- tamilebooksdownloads. blogspot.com
7. Tamil Books on line- books.tamil cube.com
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	**<40%**	**≥ 40%and<70%**	**≥70%**
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – IV			
Part I French	**French Literature and Grammar II**		
Course Code: 23ULFA41/ 23ULFB41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- To explore the French Literature.
- To appreciate the values imbibed in the literary texts
- To develop an interest in the French literature that will encourage her to pursue higher studies in French.
- To analyse and interpret verbal expressions of cause, effect, purpose, and opposition in French

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	comprehend the French literary background and inculcate the values imparted through the literary texts	K1
CO-2	interpret a literary text, with the perspective of analyzing the content and manner of writing	K2
CO-3	imbibe the basic grammatical structures of the language to demonstrate knowledge of various expressions used to convey opinion, emotions, cause, effect, purpose, and hypothesis in French	K3
CO-4	analyze simple literary texts to acquire literary knowledge and enhance aesthetic perception	K4
CO-5	evaluate and reflect on the humanistic value by reflecting upon the author's ideas and transform her own personality	K5

SEMESTER – IV			
Part I French	**French Literature and Grammar II**		
Course Code: 23ULFA41/ 23ULFB41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – XVIII^{e} siècle

1.1 – Candide : il faut cultiver notre jardin - Voltaire
1.2 – Le Barbier de Séville - Beaumarchais
1.3 – Les pronoms relatifs

Unit II – XIX^{e} siècle

2.1 – Le lac - Alphonse de Lamartine
2.2 – La mare au diable (extrait) - Georges Sand
2.3 – Le présent du conditionnel

Unit III – XX^{e} siècle

3.1 – Pour faire le portrait d'un oiseau - Jacques Prévert
3.2 – Mémoires d'une jeune fille rangée (extrait)- Simone de Beauvoir
3.3 – Le subjonctif présent

Unit IV Francophonie - Belge

4.1 – Monsieur friquet – Camille Lemonnier
4.2 – Le discours indirect
4.3 – La comparaison

Unit V – Francophonie – Afrique noire

5.1 – Le Mandat (La carte d'identité) - Ousmane Sembène
5.2 – L'expression de la cause et conséquence
5.3 - L'expression de but et opposition

Textbook:

- Textes complié par le département de français
- Clémence Fafa, Yves Loiseau, Violette Petitmengin, *Grammaire Essentielle Du Français A1*, Didier, 2018

Books, Journals and Learning Resources

- K. Madanagobalane, N.C.Mirakamal. *Le Francais par les Textes*. Chennai : Samhita Publications, 2019.
- Ludivine Glaud, Muriel Lannier, Yves Loiseau, *Grammaire Essentielle Du Français A1 A2*, Didier, 2015
- Blondeau Nicole, Allouache Ferroud jà, Ne Marie-Françoise. *Littérature Progressive du Français*. Paris : CLE International, 2004.

- Akyuz Anne, Bazelle-Shahmaei Bernadette, Bonenfant Joelle, Gliemann Marie-Francoise. *Les 500 exercices de grammaire*. Paris : Hachette livre, 2005
- Grégoire Maria. *Grammaire Progressive du français*. Paris : CLE International, 2002.
- Sirejols Evelyne, Tempesta Giovanna,Grammaire. *Le Nouvel Entrainez-vous avec 450 Nouveaux Exercices.* Paris : CLE International, 2002
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.conte-moi.net/node/120

PSO Relation Matrix

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	2	1	3	2	2	1	2	3	3
CO-2	3	2	2	2	2	2	2	3	3	3
CO-3	3	3	1	2	2	3	3	2	2	3
CO-4	3	3	2	2	1	1	2	2	3	3
CO-5	2	1	2	3	3	2	2	3	3	3
Ave.	2.8	2.2	1.6	2.4	2	2	2	2.4	2.8	3

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER – IV			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - IV**		
Course Code: 23UGEN41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits: 3**

Objectives:

- To enable the learners to experience the aesthetics of literary works.
- To make them use English effectively for academic purpose.
- To develop interest in the appreciation of Literature.
- To develop and integrate the use of LSRW skills.

Course Outcomes:

CO. No.	Upon completion of the course, the students will be able to	PSO Addressed	K Level
CO -1	identify and comprehend the general themes of the given works.	1,2	1
CO – 2	explain the text within their historical and cultural contexts.	1,2,3	2
CO – 3	present scholarly conversation and show their capabilities in literary competitions.	3	3
CO – 4	examine their educational and career goals.	2,4	4
CO – 5	test their understanding level in the literary development.	5	5

SEMESTER – IV			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - IV**		
Course Code: 23UGEN41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Poems

Lord Byron (1788 – 1824) : The Darkness
Robert Frost (1874 – 1963) : Home Burial
John Masefield (1878 -1967) : Laugh and Be Merry
Edgar A. Guest (1881-1959) : Don't Quit

Unit II –Prose

R.K. Narayan (1906 – 2001) : An Astrologer's Day
Stephen Leacock (1869- 1944) : How to be a Doctor

Unit III – Scenes from Literature

Christopher Marlowe (1564-1503) : The Parade of Seven Deadly Sins (Act 2 Scene 3 in *Doctor Faustus)*
William Shakespeare (1564- 1616): *Julius Caesar* – Assassination Scene (Act III – Scene I)

Unit IV – Grammar

Synthesis of Sentences
Direct and Indirect Speech

Unit V – Communication Skills

Narrative Report
Newspaper Report

Reference Books

1. Malathi, *Functional English*. New Century Book House (P) Ltd., 2007.
2. Joseph, K.V. *A Text book of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited.

Web Resources

http:/www.gradesaver.com/George-orwell-essays/study/summary
https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf The Quality of Mercy, https://poemana1ysis.com
https://learnodo-newtonic.com/famous-indian-poem

PSO Relation Matrix

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	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	3	2	3	2	3	2	2
CO-2	3	2	2	3	2	3	2	2	3	2
CO-3	2	3	2	3	3	2	3	2	2	3
CO-4	3	2	2	3	3	3	2	2	2	3
CO-5	2	2	3	3	3	2	2	3	2	3
Ave.	2.6	2.2	2.4	3	2.6	2.6	2.2	2.4	2.2	2.6

Mapping	**<40%**	**≥ 40% and < 70%**	**≥ 70%**
Relation	**Low Level**	**Medium Level**	**High Level**
Scale	**1**	**2**	**3**

SEMESTER IV			
CORE IV - ANATOMY AND EMBRYOLOGY			
Course Code: 23UBOC41	**Hrs / Week: 5**	**Hrs / Semester: 75**	**Credits: 5**

COURSE OBJECTIVE

This course aims to impart an insight into the internal structure and embryology of the most evolved group of plants, the angiosperm.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the fundamental concepts of plant anatomy and embryology.	K1
CO2	discuss the structural organization of various plant organs.	K2
CO3	relate the stages of normal and abnormal secondary growth and	K3
CO4	compare the structural organization of flower in relation to the process of pollination and fertilization.	K4
CO5	evaluate the various anatomical adaptations in plants.	K5

SEMESTER IV			
CORE IV - ANATOMY AND EMBRYOLOGY			
Course Code: 23UBOC41	**Hrs / Week: 5**	**Hrs / Semester: 75**	**Credits: 5**

UNIT I Tissues: Definition and types. Meristematic tissues: Definition, characteristics, classification of meristems (based on position). Apical organization and theories: histogen theory, tunica-corpus theory. Simple tissue: parenchyma, collenchyma and sclerenchyma (fibers and sclereids).

UNIT II Complex tissue: xylem and phloem. Secretory tissue: external and internal. Epidermal tissue system: Structure and types of stomata. Nodal anatomy. Primary structure of root, stem and leaf (dicot and monocot).

UNIT III Secondary growth in dicot stem: activity of cambium (formation of cambial ring and secondary vascular tissues, structure of wood), activity of cork cambium (formation of periderm, bark, lenticels) (*Polyalthia*). Secondary growth dicot root (*Azadirachta*). Anomalous secondary growth of stem (*Boerhaavia, Dracaena).*

UNIT IV Structure of anther, microsporogenesis, microgametogenesis. Structure and types of ovule. Megasporogenesis and megagametogenesis (*Polygonum* type). Double fertilization and triple fusion.

UNIT V Endosperm and its types (free nuclear, cellular, helobial), endosperm haustoria. Structure and development of dicot and monocot embryo. Polyembryony - types, apomixis, parthenogenesis and parthenocarpy.

Textbooks

1. Pandey, B.P. (2015). *Plant Anatomy*. New Delhi : S. Chand Publ.
2. Bhojwani, S.S., and Bhatnagar, S.P. (2000). *The Embryology of Angiosperms.* New Delhi: Vikas Publishing House.

Books for Reference

1. Bhojwani, S.S., and Bhatnagar, S.P. (1994). *Embryology of Angiosperms*. New Delhi: Vikas Publishing House.
2. Burgess, J. (1985). *An Introduction to Plant Cell Development.* Cambridge: Cambridge University Press.
3. Vimla Singh, and Alok Abhishek.(2019). *Plant Embryology and Experimental Biology*. New Delhi: Educational Publishers and Distributors.
4. Bhatnagar S.P., Dantu, P.K., and Bhojwani, S.S. (2014). *The Embryology of Angiosperms.* New Delhi: Vikas Publishing House.

5. Mauseth, J.D. (1988). *Plant Anatomy.* USA: The Benjammin/Cummings Publisher, USA.
6. Swamy, B.G.L., and Krishnamurthy, K.V. (1980). *From flower to fruit*. New Delhi: Tata McGraw Hill Co. Pvt. Ltd.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	2	3	2	3	2	3
CO 4	3	3	3	3	3	2	3	3	3	2
CO 5	3	3	2	3	2	3	3	3	2	3
Avg	3	3	2.6	3	2.6	2.8	2.8	3	2.6	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER IV			
CORE PRACTICAL IV - ANATOMY AND EMBRYOLOGY PRACTICAL			
Course Code: 23UBOCR4	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To gain proficiency in basic laboratory techniques for plant anatomy and embryology studies

COURSE OUTCOMES

CO. No.	On completion of this course, the students will be able to:	PO
CO1	define key concepts of plant anatomy and embryology.	**K1**
CO2	interpret experimental data related to plant anatomy and embryology.	**K2**
CO3	Design experiments to investigate different aspects of plant anatomy and embryology.	**K3**
CO4	analyze experimental results to draw conclusions about plant structures.	**K4**
CO5	evaluate scientific literature related to plant anatomy and embryology.	**K5**

SEMESTER IV			
CORE PRACTICAL IV - ANATOMY AND EMBRYOLOGY PRACTICAL			
Course Code: 23UBOCR4	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

1. Sectioning and observation of nodal types.
2. Observation of stomatal types by epidermal peeling
3. T.S of young stem and root (both dicot and monocot) to observe primary structure.
4. T.S of of dicot stem (*Polyalthia*), root (*Azadirachta*) to study the secondary growth.
5. Study of anomalous secondary growth in the stems of *Boerhaavia* (dicot) and *Dracaena* (monocot).
6. T.S of dorsiventral (*Mangifera*) and isobilateral (*Chloris*) leaves to observe primary structure.
7. T.S of (young and mature) anther (*Datura*).
8. Germination of pollengrains (hanging drop method)
9. Observation of different types of ovules- Anatropous, orthotropous, circinotropous, amphitropous, campylotropous (Permanent slides).
10. Observation of endosperm - Nuclear, cellular and helobial (Permanent slides).
11. Dissection and display of different stages of embryo in *Tridax*

Submission: Record note book

Reference

1. Ashok Bendre and Ashok Kumar. (2008). *Text Book of Practical Botany II*. Meerut:Rastogi Publications,2008.
2. Sharma, H.P. (2009). *Plant Embryology: Classical and Experimental.* Bombay Popular Prakashan.
3. Sundara Rajan, S. (2003). *Practical Manual of Plant Anatomy and Embryology.* New Delhi: Anmol Publications.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	3	2	1	2	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	3
CO5	3	2	2	3	3	3	3	2	3	3
Avg	3	2.8	2.6	3	3	2.8	2.6	2.4	2.8	2.8

S-Strong(3) **M-Medium(2)** **L-Low(1)**

SEMESTER IV			
General Elective IV	**Chemistry For Biological Sciences II**		
Code: 23UCHE42	**Hrs./Week: 4**	**Hrs/Sem: 60**	**Credits: 3**

Objectives

This course aims to provide a comprehensive knowledge on

- Nomenclature of coordination compounds and carbohydrates.
- Amino Acids and Essential elements of biosystem.
- Understand the concepts of kinetics and catalysis.
- Provide fundamentals of electrochemistry and photochemistry.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain knowledge on coordination compounds, water technology, carbohydrate, amino acids, nucleic acids, corrosion and photochemical process.	K1
CO-2	explain the biological role of complexes, buffer solutions and preparation of carbohydrate, amino acids, nucleic acids and photosynthesis.	K2
CO-3	demonstrate the water purification techniques, interconversion of fructose, property of carbohydrate, amino acids, nucleic acids, electrochemistry principles in corrosion, electroplating and fuel cells and reactions of hydrogen chloride.	K3
CO-4	identify the application of qualitative and quantitative analysis open ring structures of carbohydrate, ionic product of water and photosensitization process	K4
CO-5	outline the purification techniques, properties of carbohydrates, various reference electrodes and various type of photochemical process.	K5

UNIT I Co-ordination Chemistry and Water Technology

Co-ordination Chemistry**:** Definition of terms - IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$, $[Co(CN)_6]^{3-}$ Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water- determination of hardness of water using EDTA method- zeolite method-Purification techniques – BOD and COD.

Unit II Carbohydrates

Classification- preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose- starch and cellulose.

UNIT III Amino Acids and Essential elements of biosystem

Classification - Peptide linkage - Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.

UNIT IV Electrochemistry

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials - electrochemical series. Strong and weak electrolytes - ionic product of water -pH- pKa- pK_b. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells.

UNIT V Photochemistry

Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence- Quantum yield - Hydrogen -chloride reaction. Phosphorescence- fluorescence- chemiluminescence and photosensitization and photosynthesis (definition with examples).

Recommended Text

1. V. Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. Arun Bahl, B. S. Bahl, Advanced Organic Chemistry; S. Chand and Company, New Delhi, twenty third edition, 2012.
4. P. L. Soni, H. M. Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

Reference Books

1. Arun Bahl, B. S. Bahl, Advanced Organic Chemistry; S. Chand and Company, New Delhi, twenty third edition, 2012.
2. P. L. Soni, H. M. Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
3. P. L. Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
4. B. R. Puri, L. R. Sharma, M. S. Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
5. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	1	1	2	1	3	2	3	2	1
CO-2	1	3	2	2	2	2	3	2	1	1
CO-3	3	1	1	2	2	3	2	3	2	3
CO-4	3	3	2	2	2	1	3	3	2	2
CO-5	1	1	3	2	1	3	1	2	2	3
Ave.	2.2	1.8	1.8	2.0	1.6	2.4	2.1	2.3	1.8	2.0

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER IV			
Part III Generic Elective Practical IV		**Chemistry Practical II**	
Code: 23UCHER2	**Hrs/Week: 2**	**Hrs/Sem: 30**	**Credits: 1**

Objectives

This course aims to provide knowledge on

- Identification of organic functional groups
- Different types of organic compounds with respect to their properties.
- Determination of elements in organic compounds.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain an understanding of the physical state, odour, colour and solubility of the given organic compound.	K1
CO-2	identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.	K2
CO-3	compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, aldehyde, glucose and explain the reactions behind it.	K3
CO-4	analyse the aliphatic and aromatic compound.	K4
CO-5	assess the elements such as nitrogen, sulphur and halogens.	K5

SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS

The analysis must be carried out as follows:

a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehyde, ester and glucose].

b) Detection of elements (N, S, Halogens).

c) To distinguish between aliphatic and aromatic compounds.

d) To distinguish – Saturated and unsaturated compounds.

Reference Books

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
Ave.	3	3	3	3	3	3	3	3	3	3

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER IV			
NME II – HORTICULTURE			
Course Code: 23UBON41	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To equip students with the knowledge and skills necessary for successful cultivation and maintenance of plants.

COURSE OUTCOMES

CO. No.	On completion of this course, the students will be able to:	PO
CO1	recall the various types and features of gardens.	**K1**
CO2	understand the principles of horticulture and the importance of garden components in creating a cohesive garden space.	**K2**
CO3	apply knowledge of propagation techniques to propagate plants effectively to establish and maintain various garden elements	**K3**
CO4	analyze the factors influencing the successful establishment and maintenance of different garden elements, considering environmental conditions and plant requirements.	**K4**
CO5	assess the aesthetic appeal and functionality of gardening in different settings.	**K5**

SEMESTER IV			
NME II - HORTICULTURE			
Course Code: 23UBON41	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

UNIT I Definition, divisions and importance of horticulture. Plant growing structures: green houses, hot beds and cold frames. Gardening: outdoor garden – types. Garden Styles Mughal gardens, Persian gardens, Italian gardens and Japanese gardens

UNIT II Components of garden: lawn, shrubbery, flower beds and borders, rockery, carpet beds, topiary, hedges, edges, arches, pergolas, trellises, garden fences, foot paths, arbours and garden adornments

UNIT III Propagation techniques: Cutting (stem, leaf and root cutting), Layering (simple, compound and air layering), Grafting (approach, tongue and epicotyl grafting), Budding (T budding, chip and patch budding)

UNIT IV Irrigation**:** introduction, factors determining and systems of irrigation. Manuring: introduction, organic manures and chemical fertilizers. Training: Principles and methods

UNIT V Pruning: Principles and methods. Special pruning techniques. Establishment and maintenance: terrarium, hanging basket, bonsai, kitchen garden and flower arrangements.

Textbook

1. Sheela, V. L. (2011). *Horticulture*. Chennai: MJP Publishers.

Books for Reference

1. Chauhan, R. K. (2011). *Encyclopedia of General Gardening for Common People*. New Delhi, India: Dominant Publishers and Distributors.
2. De, L. C. (2012). *Handbook of Gardening*. Jaipur, India: Aavishkar Publishers, Distributors.
3. Hartmann, and Kester. (1989). *Plant Propagation*. New Delhi, India: Prentice-Hall of India Pvt. Ltd.
4. Kumar, N. (2010). *Introduction to Horticulture* (7^{th} ed.). New Delhi, India: Oxford and IBH Publishing Co. Pvt. Ltd.
5. Mallikarjuna Reddy, and Aparna Rao. (2010). *Plant Propagation in Horticulture*. New Delhi, India: Pacific Book International.
6. Randahawa. (1985). *Floriculture in India*. New Delhi, India: Allied Publishers.
7. Banerji, U. (2008). *Horticulture*. Jaipur, India: Mangal Deep Publication.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	2	3	3	3	2	3
CO4	3	3	3	3	3	3	3	3	2	3
CO5	3	3	3	3	2	3	3	3	3	3
Avg	3	3	3	3	2.6	3	3	3	2.6	3

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER IV			
SKILL ENHANCEMENT COURSE V - BIOLOGICAL TECHNIQUES PRACTICAL			
Course Code: 23UBOSE5	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To understand the basic principle and to get hands on training on bio instruments used.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	understand the definition of various bioinstruments used	K1
CO2	discuss about the principle of various bioinstruments	K2
CO3	compile the applications of various bioinstruments	K3
CO4	examine the different methods of separation and its uses	K4
CO5	evaluate and experiment different bioinstrument used to determine plant samples	K5

SEMESTER IV			
SKILL ENHANCEMENT COURSE V - BIOLOGICAL TECHNIQUES PRACTICAL			
Course Code: 23UBOSE5	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

UNIT I **Microscopy:** Light microscope (Simple and Compound), Principle and working mechanism of light microscope. Experiments: Double staining of T.S. of dicot stem and monocot stem and observe under microscope.

UNIT II **Separation techniques:** Centrifugation: Principle, working mechanism and applications of centrifuge. Experiment: Separation of plant particles based on their density, separation of plant protein.

UNIT III **Chromatography:** Principle, types (partition, absorption), working mechanism and application of chromatography. Experiments: Circular paper chromatography using dyes, separation of photosynthetic pigment using TLC.

UNIT IV **Measurement of pH:** Buffers, types. pH meter: principle, working mechanismand application of pH meter. Experiments: Preparation of phosphate buffer,

UNIT V **Measurement of colours:** Principle (Beer's law, Lambert's law), working mechanism and applications of colorimeter. Experiments: Determination of complementary colours, verification of Beer Lambert's law.

Text books

1. Jayaraman, J. (2008). *Laboratory Manual in Biochemistry*. New Delhi: New Age International (P) Limited Publishers.
2. Veerakumari, L. (2017). *Bioinstrumentation*. India: MJP Publisher.

Books for Reference

1. Narayana, P. S. D., Varalakshmi, T., and Pullaiah. (2016). *Research Methodology inPlant Science*. Jaipur, Rajasthan: Scientific Publishers.
2. Pomurugan, P., and Gangathara Prabhu, B. (2012). *Biotechniques*. Chennai: MJP sPublishers.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	2	2	3	3	3	3
CO5	3	3	2	2	2	2	2	2	3	3
Avg	3	3	2.8	2.6	2.6	2.6	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER IV			
ABILITY ENHANCEMENT COURSE II – VALUE ADDED PRODUCTS FROM PLANTS			
Course Code: 23UBOA41	**Hrs / Week: 1**	**Hrs / Semester: 15**	**Credit: 1**

COURSE OBJECTIVE

To enhance the knowledge of the students about value added products from plants and ensure them to become a solopreneur.

COURSE OUTCOMES

CO. No.	On completion of this course, the students will be able to:	PO
CO1	recall the uses of edible and nonedible parts of the plants.	**K1**
CO2	explain the process of making coco peat, coir, jaggery, butter, disinfectants	**K2**
CO3	identify the different value added products from different parts of the plants.	**K3**
CO4	evaluate the process of preparation wine, rose syrup, raisins.	**K4**
CO5	recommend method for extraction of oil from coconut, neem, groundnut.	**K5**

SEMESTER IV			
ABILITY ENHANCEMENT COURSE II – VALUE ADDED PRODUCTS FROM PLANTS			
Course Code: 23UBOA41	**Hrs / Week: 1**	**Hrs / Semester: 15**	**Credit: 1**

UNIT I **Coconut:** Preparation of coconut oil, dessicated coconut powder, coconut milk, coconut vinegar, coconut candy, coconut shell charcoal, coir, coco peat.

UNIT II **Palm:** Preparation of jaggery, palm plates, palm baskets. **Banana:** Preparation of flour, chips, fibres.

UNIT III **Tomato:** Preparation of jam, pickle, puree, squash. **Mango:** jam, pickle, juice, squash. **Grapes:** Preparation of grape jelly, raisins, wine.

UNIT IV **Amla:** Preparation of honey amla, squash, dry candy. **Rose**: Preparation of rose syrup, rose water, Gulkhand

UNIT V **Ground nut:** Preparation oil, butter, candy. **Neem:** Preparation of oil, seed cake, disinfectants.

Textbook

1. Raina, U., Kashyap, S., Narula, V., Thomas, S., Suvira, S., and Chopra, S. (2007). *Basic Food Preparation-A complete Manual*. Hyderabad: Orient Longman Pvt. Ltd.

Books for Reference

1. Sharangi, A. B., and Datta, S. (2015). *Value addition of horticultural crops: Recent trends and future direction.* India: Springer Publishers.
2. Devi, K. Prabhabati, Singh, H. Naresh, and Saikat, S. (2023). *Value addition of horticultural crops: A handbook for rural foodpreneurs.* New Delhi: Today and Tomorrow's Printers and Publishers.
3. De, L. C. (2011). *Value addition in flowers and orchids.* New Delhi: New Delhi Publishing Agency.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	2	2	2	3	3	2
Avg	3	3	2.8	2.8	2.8	2.8	2.8	2.8	3	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER V			
CORE V - TAXONOMY OF ANGIOSPERMS			
Course Code: 23UBOC51	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVE

To understand the basic concepts of classification, characteristics and economic importance of the selected families

COURSE OUTCOMES

CO. No.	Upon completion of this course, the students will be able to	PO
CO1	define the concepts in plant morphology and rules of IUCN in botanical nomenclature.	**K1**
CO2	discuss the core concepts of economic botany and relate its applications in human life	**K2**
CO3	classify systems of plant classification and recognize the importance of herbarium and virtual herbarium.	**K3**
CO4	analyze the characters of the families according to the Bentham and Hooker's system of classification.	**K4**
CO5	evaluate terms and concepts related to Phylogenetic Systematics.	**K5**

SEMESTER V			
CORE V - TAXONOMY OF ANGIOSPERMS			
Course Code: 23UBOC51	**Hrs/ Week: 4**	**Hrs/ Semester: 60**	**Credits: 4**

UNIT I Taxonomy: definition and scope. Modification of root, stem and leaf. Venation, apices, margins and arrangements of leaf. Types and modification of stipules. Types of inflorescence (simple, compound and special). Terms used in description of calyx, corolla, androecium and gynoecium.

UNIT II Systems of classification: natural (Bentham and Hooker), phylogenetic (Engler and Prantl's system) and APG IV classification. Botanical nomenclature: vernacular names, binomial. Principles of ICBN. Herbarium technique and Botanical Survey of India.

UNIT III Vegetative, floral characters and economic importance of Annonaceae, Nymphaceae, Rutaceae, Caesalpiniaceae, Myrtaceae and Cucurbitaceae.

UNIT IV Vegetative, floral characters and economic importance of Asteraceae Apocynaceae, Asclepiadaceae, Convolvulaceae, Acanthaceae and Lamiaceae.

UNIT V Vegetative, floral characters and economic importance of Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae and Poaceae.

Text Books

1. Pandey, B. P. (1999). *Economic Botany*. New Delhi: S. Chand and Company Ltd.
2. Sharma, O. P. (1996). *Plant Taxonomy*. New Delhi: Tata McGraw-Hill Publishing Company Ltd.

Books for Reference

1. Jones, S. B. Jr., and Luchsinger, A. E. (1986). *Plant Systematics* (2nd edition). New York: McGraw-Hill Book Co.
2. Lawrence, G. H. (1955). *Taxonomy of Vascular Plants*. USA: MacMillan Co.
3. Lawrence, G. H. M. (1985). *An Introduction to Plant Taxonomy*. Allahabad: Central Book Depot.
4. Naik, V. N. (1984). *Taxonomy of Angiosperms*. New Delhi: R. Chand and Co.
5. Pandey, B. P. (2005). *Taxonomy of Angiosperms*. New Delhi: S. Chand & Company Ltd.
6. Shukla, P., and Misra, S. P. (1997). *An Introduction to Taxonomy of Angiosperms*. New Delhi: Vikas Pub. House Ltd.
7. Singh, G. (2004). *Plant Systematics*. New Delhi: Oxford and IBH Publishing Co. PVT. Ltd.
8. Vashista, P. C. (1985). *Taxonomy of Angiosperms*. New Delhi: Vikas Publications.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	3	3	3	2	3
CO4	3	3	3	3	2	3	3	2	3	2
CO5	3	2	2	2	3	3	2	3	3	3
Avg	2.8	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER – V			
CORE VI - PLANT PHYSIOLOGY			
Course Code: 23UBOC52	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVE

To understand the complexity of life process in plants and learn the metabolism at the level through lecture mode

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	describe the fundamental physiological processes in plants.	K1
CO2	explain the physiological processes occurring in different plant tissues.	K2
CO3	apply critical thinking skills to analyze complex physiological processes in plants.	K3
CO4	analyze the physiological processes involved in plant growth, development, and metabolism.	K4
CO5	evaluate how plants respond and adapt to environmental factors, including light, temperature, air and water availability.	K5

SEMESTER – V			
CORE VI - PLANT PHYSIOLOGY			
Course Code: 23UBOC52	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I **Plant Water Relations:** Importance of water to plant life, Physical processes: Imbibition, diffusion, osmosis, plasmolysis and water potential, Active and passive absorption of water, Path and mechanism of ascent of sap, (Dixon's cohesion theory), Types of transpiration, Factors affecting transpiration, Importance of transpiration, Mechanism of stomatal movement (starch-sugar inter conversion theory and proton transport and hormonal regulation theory), Guttation.

UNIT II **Solute relations:** Deficiency and toxicity symptoms of essential macro and micro elements in plant nutrition, Mechanism of mineral absorption : modern views of solute transport across membrane. **Translocation of organic solutes:** Path of translocation of organic solutes, mechanism of phloem transport, source-sink relationship, factors affecting translocation. Biological nitrogen fixation.

UNIT III **Photosynthesis:** Electromagnetic spectrum, Photosynthetic apparatus: thylakoid membrane, light harvesting complex. absorption and action spectrum, quantum requirement and quantum yield, Red drop and Emerson enhancement effect. **Photochemical reaction and electron transport:** cyclic and non-cyclic photophosphorylation. **CO_2 fixation**: C_3 cycle and C_4 cycles. Factors affecting photosynthesis.

UNIT IV **Respiration**: Respiratory substrates, Glycolysis, Krebs cycle, Electron transport cycle and chemiosmotic synthesis of ATP, lactic acid fermentation, alcohol fermentation, Pentose Phosphate Pathway (PPP). Factors affecting respiration.

UNIT V **Growth:** Definition, phases of growth, factors affecting growth. **Plant growth regulators:** origin, physiological action and practical applications of auxin, gibberellin cytokinin, abscisic acid and ethylene. **Physiology of flowering:** Photoperiodism, Vernalization. **Seed dormancy:** causes and methods of seed dormancy, Physiology and biochemistry of seed germination.

Text books

1. Jain, V.K. (2004). *Fundamentals of Plant Physiology*. New Delhi: Chand and Co. Ltd.
2. Salisbury, F.B., and Ross, C.W. (2007). *Plant Physiology*. Thomson Wordsworth.
3. Taiz, L. and Zeiger, E. (1988). *Plant Physiology*. United States of America: Sinauer Associates. Publishers Massachusetts.

Books for Reference

1. Beevers, L. (1976). *Nitrogen metabolism in plants.* London: William clowes and sons Ltd.
2. Bidwell, R.G.S. (1979). *Plant physiology*. New York: Macmillan publishing company.

3. Devlin, R.M. (1974). *Plant Physiology*. New Delhi: Narosa publishing House.
4. Noggle, G.R., and Fritz, G.J. (2002). *Introductory plant physiology*). New Delhi: Prentice Hall.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	3	2	3	3	3	3	3	3
CO3	2	3	3	3	2	3	2	3	2	3
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	3
Avg	2.8	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER V			
CORE VII - PHYTOCHEMISTRY			
Course Code: 23UBOC53	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVE

Exploring the plant resources as pharmaceuticals and nutraceuticals and to acquire knowledge on identification, extraction and utilization of phytochemical constituents through teaching and training.

COURSE OUTCOMES

CO. No	Upon completion of this course, students will be able to	PO
CO 1	recall the promising role of the phytoconstituents as cytotoxicity and substantiate them for the treatment offatal diseases	K1
CO 2	discuss the importance of secondary metabolites and relate them in treating the ailments	K2
CO 3	apply the medicinal properties of plants in therapeutic applications by using their chemical elements.	K3
CO 4	analyse of qualitative and quantitative medicinal compounds in herbal drug preparation.	K4
CO 5	evaluate the medicinal compounds with their natural resources	K5

SEMESTER V			
CORE VII - PHYTOCHEMISTRY			
Course Code: 23UBOC53	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I Phytochemistry, histochemistry. **Secondary metabolites**: definition, classification, preliminary phytochemical screening. Biosynthetic pathway for secondary metabolites. Glycosides: Definition, properties, classification, natural sources, pharmacological and toxicological effects of glycosides.

UNIT II Definition, properties**,** natural sources and therapeutic applications of Terpenoids: β-Sitosterol, Glycyrrhizin. Phenolics: Coumarins and Tannins. Steroids and alkaloids.

UNIT III Flavonoids: Definition, properties, classification, natural sources and therapeutic applications. Medicinal uses of resins.

UNIT IV Extraction methods: infusion, percolation, decoction, soxhlet extraction,

supercritical fluid extraction, distillation, counter-current Extraction, and cold extraction.

UNIT V Volatile oils - source, constituents, properties, extraction and utilization of lemon grass oil, vetiver oil, clove oil and eucalyptus oil. Trade of medicinal plants.

Text Books

1. Tewari, K. S., Vishogi, N. K., and Mehrotra, S. N. (1998). *Textbook of Organic Chemistry*. Uttar Pradesh: Vikas Publishing House Ltd.
2. Evens, W. C. (1987). *Pharmacognosy Medicinal and Aromatic Crops.* Singapore: Harcourt Brace and Company Asian Pvt. Ltd., Universities Press.
3. Yohanarasimban, S. N. (2004). *Medicinal Plants of India*. Jodhpur.
4. Wallis. (2003). *Textbook of Pharmacognosy.* New Delhi: CBS Publishers.

Books for Reference

1. Agarwal, S. S., and Paridhavi, M. (2007). *Crude Drug Technology*. Hyderabad: Universities Press.
2. Farooqui, A. A., and Sreeramu, B. S. (2001). *Cultivation of Medicinal and Aromatic Crops.* Pune: Universities Press.
3. Chatwal, G. (1983). *Organic Chemistry of Natural Products*. Mumbai: Himalaya Publishing House.
4. Kokate, C. K., Purohit, A. P., and Gokhale, S. R. (2004). *Pharmacognosy*. Pune: Nirali Prakshan Publishing House Ltd.
5. Tewari, K. S., Vishogi, N. K., and Mehrotra, S. N. (1998). *Textbook of Organic Chemistry*. Uttar Pradesh: Vikas Publishing House Ltd.
6. Trivedi, P. C. (2004). *Medicinal Plant Conservation and Utilization*. Jaipur: Aavishkar Publishers.
7. Trivedi, P. C., and Sharma, N. K. (2004). *Ethnomedicinal Plants.* Jaipur: Pointer Publishers.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	3	3	3	3
CO3	3	3	3	2	2	3	3	3	3	2
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	3	3	3	3	3
Avg	3	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER V			
CORE VIII - CELL BIOLOGY AND GENETICS			
Course Code: 23UBOC54	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVES

1. To learn about the basic cellular components and principles of their functions.
2. To understand the classical Mendelian theory on heredity and alterative pattern of gene expression.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the structure and function of basic organelles of plant cells andthe structural organization and function of nucleus.	K1
CO2	explain about the chromosome and cell division of plant cell.	K2
CO3	construct and compare the Mendelian inheritance and itsmodifications	K3
CO4	analyze and decipher the significance of phenotypes that results from Mendelian principles of inheritance, X linked and cytoplasmic model of inheritance.	K4
CO5	conclude the quantitative traits and the results of many gene combination that each can contribute a varying amount to a phenotype and linkage crossing over, mutation.	K5

SEMESTER V			
CORE VIII - CELL BIOLOGY AND GENETICS			
Course Code: 23UBOC54	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I Ultra structure of the plant cell, chemistry of cell wall, plasma membrane, unit membrane structure, Fluid mosaic model. Ultra structure of endoplasmic reticulum and Golgi apparatus

UNIT II Ultra structure and functions of chloroplast, mitochondria, ribosome and nucleus, lysosome, peroxisome and glyoxisome.

UNIT III Ultra structure, types and functions of chromosome. Non-living inclusions: starch grains, cystolith, raphides and aleurone. Cell division: Mitosis and meiosis.

UNIT IV **Genetics:** Mendel's laws of heredity with reference to monohybrid and dihybrid crosses, back cross and test cross. Incomplete dominance – *Mirabilis jalapa*. Lethal gene action in maize.

UNIT V **Multiple alleles:** Definition, features. Multiple gene inheritance: (ear size in *maize,* colour of kernel in wheat). Linkage and crossing over: definition, morgan's experiment (coupling and repulsion), definition of crossing over, crossing over in *maize,* cytology of crossing over, mechanism of crossing over.

Text books

1. Verma PS. (2006). *Cell Biology, Genetics, Molecular Biology*. S. Chand and Co., NewDelhi.
2. Rastogi S.C. (2010). *Cell and Molecular Biology.* India: New Age InternationalPublishers.
3. Verma P.S., and Agarwal V.K. (2006). *Cytology.* India: S. Chand and Company.

Books for reference

1. Veer Bala Rastogi. (2016). *Fundamentals of Molecular Biology.* India: MEDTECH.
2. Palanivelu, P. (2004). *Laboratory Manual for analytical biochemistry and separation techniques,* School of Biotechnology, Madurai Kamaraj University, Madurai.
3. Singh, B. D. (2004). *Genetics*, Kalyani Publishers, New Delhi.
4. Sheeler, P., and Binachi, D. E. (2007). *Cell and Molecular Biology*, John Wile and Sons,New York.

MAPPING WITH PROGRAMME OUTCOMES:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	3	3	3	3
CO3	3	3	3	2	2	3	3	3	3	2
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	3	3	3	3	3
Avg	3	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER – V			
CORE PRACTICAL V- TAXONOMY OF ANGIOSPERMS AND PLANT PHYSIOLOGY PRACTICAL			
Course Code: **23UBOCR5**	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credit: 2**

COURSE OBJECTIVES

1. To facilitate students' direct engagement with experimental techniques, fostering a deeper understanding of plant physiological processes and cultivating practical skills for scientific inquiry in plant biology.
2. To furnish first - hand learning experience in plant collection and describe the diagnosticfeatures of plant in technical terms with the aim of identifying the taxa.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO-1	recall the botanical names, family character, fundamentals of water and its relation to plants.	KI
CO-2	explain the role of pigment in photosynthetic mechanism and related events of plants.	K2
CO-3	demonstrate the techniques in herbarium, importance of light in stomatal movement, plant growth and harvest of energy	K3
CO-4	investigate how the physical process and chemical connection determine plant's function and to layout practical skills in conducting a physiological experiments.	K4
CO-5	evaluate the practical skills gained during the course and create idea to seek for suitable job in relevant industries.	K5

SEMESTER – V			
CORE PRACTICAL V - TAXONOMY OF ANGIOSPERMS AND PLANT PHYSIOLOGY PRACTICAL			
Course Code: 23UBOCR5	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credit: 2**

Taxonomy of Angiosperms

1. Dissect and display the floral parts of the typical members of the families prescribed in the syllabus.
2. Survey of locally available plant species belonging to the families prescribed in the syllabus. Mounting of a properly dried and preserved specimen of any two wild plants with herbarium label, 10 photographs and field note to be submitted.
3. Construction of taxonomic keys (dichotomous)
4. Preparation of digital herbarium.
5. Study of various root, stem and leaf modifications
6. Study the economically important plant products from the members of the families prescribed in the syllabus.

   Field trip: A field trip for 1-2 days.

Plant Physiology

1. Imbibition by direct weight method
2. Determination of water potential by gravimetric method
3. Study of membrane permeability using different temperature method
4. Determination of differential transpiration of leaf surface using cobalt chloride method
5. Estimation of magnesium in plant tissue.
6. Measurement of rate of photosynthesis by using different filters.
7. Effect of sodium bicarbonate concentration on the rate of photosynthesis.
8. Extraction and separation of chloroplast pigments by ascending paper chromatography
9. Estimation of auxin

References

1. Ashok Bendre and Ashok Kumar. (2008). *Text Book of Practical Botany II*. Rastogipublications Meerut.
2. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. (2013). *Practicals in plant physiology and biochemistry.* Scientific Publishers (India).
3. Francis, H., Witham David, F., Blaydes and Robert, N. (1970). *Experiments in Plant Physiology*. New Delhi: Vanmostr and Rain hold Company.
4. Gamble, J.S. (1997). *Flora of Presidency of madras, Volume I to III.* London: Adlard and Son Ltd.
5. Mathew, K.M. (1984). *The flora of Tamil Nadu, Carnatic. Volume I to III.* Tiruchirapalli: Rapinet herbarium, St. Joseph's College.
6. Singh, S.K. (2009). *Advanced practical Botany*. New Delhi: Campus books International.

MAPPING WITH PROGRAMME OUTCOMES:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	2	2	3	3	3	3	2
CO 3	2	3	3	3	3	3	3	2	3	2
CO 4	3	2	3	3	3	3	3	3	3	3
CO 5	3	2	2	3	3	2	3	3	2	3
Avg	2.8	2.6	2.8	2.8	2.8	2.8	3	2.8	2.8	2.6

S-Strong (3) **M-Medium (2)** **L-Low(1)**

SEMESTER – V			
CORE PRACTICAL VI – PHYTOCHEMISTRY, CELL BIOLOGY AND GENETICS PRACTICAL			
Course Code: 23UBOCR6	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 2**

COURSE OBJECTIVE

To gain proficiency in basic laboratory techniques for cell biology and genetics and develop skills in techniques for secondary metabolites studies.

COURSE OUTCOMES

CO. No	On completion of this course, the students will be able to:	PO
CO1	define key concepts related to cellular processes, genetics andphytochemistry	**K1**
CO2	interpret experimental data related to cell biology, genetics andphytochemistry	**K2**
CO3	Design experiments to investigate different aspects of cell biology, genetics and phytochemistry.	**K3**
CO4	analyze experimental results to draw conclusions aboutcellular processes, genetic mechanisms and secondary metabolites.	**K4**
CO5	evaluate scientific literature related to cell biology, genetics andPhytochemistry.	**K5**

SEMESTER – V			
CORE PRACTICAL VI – PHYTOCHEMISTRY, CELL BIOLOGY AND GENETICS PRACTICAL			
Course Code: 23UBOCR6	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 2**

PHYTOCHEMISTRY

1. Morphology, histology and powder characteristics of
   Cinnamon, Clove, Fennel and *Coriander*
2. Isolation and detection of active principles:
   Caffeine from *Tea* dust
   Sennosides from *Senna*
   Curcumin from *Turmeric*
3. Analysis of crude drugs by chemical tests for the detection of
   Glycosides -*Senna*, *Aloe, Liquorice*
   Terpenoids - *Coriander*, *Fennel*, *Cinnamom*
   Alkaloids - *Datura*, *Vinca*, *Pepper*
   Lipids - *Castor*, Neem, Sesame, Groundnut oil
   Resin – Ginger, *Asafoetida*.
   Volatile oil – Lemon and Clove
4. Distillation of volatile oils and detection of phytoconstituents by TLS *Jasmine* and *Eucalyptus.*

CELLBIOLOGY AND GENETICS

1. Isolation of polytene chromosome from *Chironomus* larva.
2. Study of mitotic cell division-onion root tip squash for chromosomal examination – Haematoxylin staining.
3. Study of meiotic cell division-Tradescantia/Rheo for chromosomal examination –Acetocarmine staining.
4. Genetic problems - test cross, back cross and gene interaction.
5. Genetic problems on monohybrid, dihybrid.
6. Chromosome mapping based on three points cross and crossing over.
7. Karyotype analysis in plant species

Spotters

1. Study of the photomicrographs of cell organelles.
2. Ergastic substances - starch grains, aleurone grains, crystals – cystolith and raphide.
3. Study the polytene and lamp brush chromosome structure through photograph.
    - Submission of record

References

1. Bendre, A. M., and Ashok Kumar. (2009). *A text book of practical Botany. Vol. I and II.* (9^{th} ed.). Meerut: Rastogi Publication.
2. Jackson, S. A., Kianian, S. F., Hossain, K. G., and Walling, J. G. (2012). *Practical laboratory exercises for plant molecular cytogenetics.* (pp. 323-333). Springer, New York, NY.
3. Kokate, K. C., and Gokhale, S. B. (2008). *Practical Pharmacognosy*. Pune.
4. Chauhan, M. G., and Pillai, A. P. G. (2005). *Microscopic Profile of Powdered Drugs Used in Indian Systems of Medicine*. Jamnagar: Institute of Ayurvedic Medicinal PlantSciences.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	2	3
CO5	3	2	2	3	3	3	3	2	3	3
Avg	3	2.8	2.8	3	3	2.8	3	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER V			
DISCIPLINE SPECIFIC ELECTIVE I - MOLECULAR BIOLOGY			
Course Code: 23UBOE51	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVE

To study about components that make up nucleic acids and its metabolism.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the basic structure of nucleic acids, genetic code, gene concepts and gene regulations	K1
CO2	discuss types of DNA, methods of replication, cellular machinery fortranslation, gene regulation	K2
CO3	present DNA, RNA as genetic material, mechanism of transcription and translation, gene regulation	K3
CO4	analyse DNA damage, repair mechanism, enzymes used in replication, gene regulation	K4
CO5	evaluate experiments in nucleic acids, DNA replication and repairmechanism	K5

SEMESTER V			
DISCIPLINE SPECIFIC ELECTIVE I - MOLECULAR BIOLOGY			
Course Code: 23UBOE51	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I **Nucleic acids:** Central dogma of molecular biology. DNA: Watson and Crick Model of DNA, Different forms of DNA (A, B, C, Z forms), Chargaff's rule, Griffith's experiment to prove DNA as genetic material. RNA: Structure, typesand experiment to prove RNA as genetic material.

UNIT II **DNA Replication:** Semi conservative model, Enzymes used in replication, Mechanism of replication in prokaryotes and eukaryotes. Gene Organization: Promoter-structure and function in prokaryotes and eukaryotes, types of genes and its function.

UNIT III **Transcription:** Enzymes involved in transcription, Mechanism of transcription (initiation, elongation and termination) in prokaryots and Eukaryots, Post transcriptional changes. Translation: Mechanism of protein synthesis (initiation, elongation and termination) in prokaryotes and Eukaryotes,

UNIT IV **Gene action and regulation:** Relation of gene and enzymes - one gene one enzyme hypothesis, regulation of metabolism, inducible and repressible enzymes, Gene regulation in prokaryotes (Lac Operon Model) and eukaryotes (Britten and Davidson's Model). Genetic code: characteristics, Wobble hypothesis.

UNIT V **Techniques in molecular biology:** Isolation of plant genomic DNA, Separation of DNA using AGE, Quantification of DNA, Simple problems in transcription, translation and genetic code.

Text books

1. Dhingra, G. K. (2021). *Cell, Molecular Biology and Biotechnology.* Haldwani, Nainital: Uttarakhand Open University.
2. Gupta, P. K. (2018). *Molecular Biology.* Meerut, Uttar Pradesh: Rastogi Publications.
3. Rastogi, V. B. (2010). *Fundamentals of Molecular Biology*. New Delhi: Ane BooksIndia.

Books for Reference

1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., and Watson, J. D. (1989). *Molecular biology of the Cell* (2nd ed.). Garland Pub. Inc., New York.
2. Karp, G. (1999). *Cells and Molecular Biology: Concepts and Experiments*. John Wiley and Sons, Inc., USA.
3. Lodish, S., Baltimore, B., Berk, C., and Lawrence, K. (1995). *Molecular Cell Biology* (3rd ed.). Scientific American Books, N.Y.
4. De Robertis, and De Robertis. (1988). *Cell and Molecular Biology* (8th ed.). Info-Med,Hongkong.
5. Lewin, B. (2000). *GENE VII*. Oxford University Press, New York, USA.
6. Cooper, G. M., and Hausman, R. E. (2007). *The Cell: Molecular Approach 4th Edn* Sinauer Associates, USA.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	2	2
CO3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	2	3	2	3	3	3	3	3
CO5	2	2	3	3	3	2	2	2	3	3
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER V			
DISCIPLINE SPECIFIC ELECTIVE I - ETHNOBOTANY			
Course Code: 23UBOE52	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVE

To give an overall view of ethnobotany, tribal medicines and their importance.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the common traditional medicines used in day today life	K1
CO2	discuss about the various tribes in Tamil Nadu and the medicinal plants used by them	K2
CO3	compile the use of selective medicinal plants and their parts of use	K3
CO4	examine the different conservation methodology of traditional plants	K4
CO5	value the status of sthalavriksha in various temples	K5

SEMESTER V			
DISCIPLINE SPECIFIC ELECTIVE I - ETHNOBOTANY			
Course Code: 23UBOE52	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I **Ethnobotany:** Introduction, concept, scope and objectives. Basic knowledge of tribes in India with special reference to Tamil Nadu: Todas, Irulas, Kani and Paliyars, tribal knowledge towards disease diagnosis, treatment, medicinal plants, plant conservation, cultivation, tribal medicines and their role in community herbal gardens.

UNIT II **Herbal Preparations:** Collection of wild herbs. Capsules, compresses, elixirs. Hydrotherapy or herbal bath, herbal oils, liquid extracts or tincture, poultices, salves, slippery elm, slurry tea. Methods of drug adulteration.

UNIT III Plants in folk religion: Medicinal uses and significance of *Aegle marmelos, Ficus benghalensis, Curcuma domestica*, *Cyanodon dactylon and Sesamum indicum*.

UNIT IV **Role of tribals in conservation:** Sacred grooves, taboos and deity associated ecological role of plants. Elementary account on the sacred grooves in Tamil Nadu. Sthalavrikshas and its importance. Endangered taxa and forestmanagement.

UNIT V **Ethnobotany and legal aspect:** Ethnobotany as a tool to protect interests of ethnic groups. Traditional knowledge in relation to Intellectual Property Rights(IPR), Biopiracy.

Text books

1. Rosaline, A. (2011). *Pharmacognosy*. Chennai: MJP Publishers, New Delhi.
2. Suresh Kumar, D. (2018). *Ethnobotany, Volume 1*. Kojo Press, New Delhi.

Books for Reference

1. Bhadari, Ramesh. (2011). *Medicinal Plants and their Conservation.* New Delhi: Cyber Tech Publications.
2. Jain, S. K. (2004). *Glimpses of Indian Ethnobotany*. Chennai: MJP Publishers.
3. Singh, M. P., Oraon, B. C., and Prasad, Narendra. (2009). *Medicinal Plants*. New Delhi: APH Publishing Corporation.
4. Trivedi, P. C., and Sharma, N. K. (2004). *Ethnomedical plants.* New Delhi: PointerPublishers.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	2	3	3	3	3	3
CO3	2	3	3	2	3	2	3	3	2	2
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	2	3	3	3	3	2	2	3	3
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER V			
Ability Enhancement Course III Environmental Studies			
Course Code: 23UAEV51	**Hrs/ week: 2**	**Hrs/Sem:30**	**Credits: 1**

Course Outcomes:

Upon completion of this course, the students will be able to

1 Recognize the biotic and abiotic components of ecosystem and how they function.
2 Use natural resources more efficiently and know more sustainable ways of living.
3. Acquire an attitude of concern for the environment.
4. Participate in improvement and protection of environment.
5. Manage unpredictable disasters.
6. Create awareness about environmental issues to the public.

Unit I :

Environment and Ecosystem: Aim and need for Environmental Awareness - Components of Environment Ecosystem - Components of Ecosystem: Abiotic and biotic factors (Producer, Consumer and Decomposer) – Food Chain, Tropic Levels - Food Web, Energy flow and Ecological pyramids

Unit II :

Natural Resources: Renewable and non-renewable resources – Water Resources: Uses and Conservation of Water – Rain Water Harvesting – Forest Resources: Importance of Forests - Major and Minor forest produces - Conservation of Forest Energy Resources: Solar Fossil Fuel – Wind – Role of individuals in the conservation of natural resources

Unit III :

Environmental Pollution: Pollutants – Types of pollution: Air, Water, Noise and Plastic Pollution – Causes, effects and Control measures – Global warming and Climate Change

Unit IV:

Human Population and Environment: Effect of human population on environment – Population Explosion problems related to population explosion – Involvement of population in conservation of environment – Measures adopted by the Government to control population growth – Environment and human health

Unit V:

Disaster Management: Floods–Drought–Earthquakes– Cyclones – Landslide–Tsunami–Control measures

SEMESTER V	
SELF STUDY II - BOTANY FOR COMPETITIVE EXAMINATION	
Course Code: 23UBOSS2	**Credits: +2**

COURSE OBJECTIVE

To enhance the competency of students at the national level and provide fundamental concepts across the spectrum of Botany.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the questions related to biodiversity, origin and their phylogenetics of plants	K1
CO2	indicate the importance of soil nutrients and their absorption and assimilation by plants that will support them to answer various disciplines associated with botany	K2
CO3	predict a pathway of the molecular mechanism of photosynthesis.	K3
CO4	investigate and understand the concept to answer the energy metabolism in biology	K4
CO5	recommendations of morphogenesis that facilitates them to answer questions in professional examinations.	K5

SEMESTER V	
SELF STUDY II - BOTANY FOR COMPETITIVE EXAMINATION	
Course Code: 23UBOSS2	**Credits: +2**

UNIT I **Plant Diversity:** General characters of algae, structure, reproduction and life history of *Oedogonium, Chara, Ulva* and *Gracilaria*. General characters of following groups: Ascomycetes, Basidiomycetes and Deuteromycetes. Structure, reproduction and life history of *Albugo*, *Rhizophous* and *Peziza*. Study of growth forms of lichens (crustose, foliose and fruticose), thallus organization, reproduction and ecological significances. General account of bryophytes, morphology, anatomy, spore dispersal mechanisms in, spore germination patterns in bryophytes, reproduction of following species *Riccia, Marchantia and Funaria.* General characteristics of pteridophytes, reproduction, Stellar evolution, alternation of generation, abnormalities in life cycle (apogamy and apospory), life cycle of following genera *Lycopodium*, *Selaginella* and *Adiantum.* General account of Gymnosperms: morphology, anatomy, reproduction of following species *Cupressus*, *Araucaria*, and *Gnetum*.

UNIT II **Cell and Molecular Biology**: Structure of prokaryotic and eukaryotic cell, Structure and functions of cytoplasmic organelles: mitochondria, chloroplast, endoplasmic reticulum, golgi apparatus, ribosomes, lysosome, Plant Cell: Nucleus - morphology, ultrastructure, nucleoplasm, nucleolus, functions. Cell divisions: Cell cycle - mitosis, meiosis. Chromosome - number, morphology, structure, karyotype and ideogram, chemical composition, euchromatin and heterochromatin, giant chromosomes. Central dogma of molecular biology. Nature of genetic material, biological evidences to prove DNA as genetic material, DNA damage and repair, DNA replication in prokaryotes and eukaryotes, model, eukaryotes – replication, fork, Messelson and Stahl's experiment, molecular mechanism of DNA replication. Gene Organization: Promoter-structure and function in prokaryotes and eukaryotes, Genetic code and translation, Gene action: relation of gene and enzymes - one gene one enzyme hypothesis, regulation of metabolism, inducible and repressible enzymes. gene regulation - in prokaryotes (Lac Operon Model) and eukaryotes (Britten and Davidson's Model).

UNIT III **Physiology and Biochemistry:** Plant Water Relations, Absorption and transport of water, Transpiration, Solute relations: Mineral nutrition, Translocation of organic solutes, Nitrogen metabolism, Photosynthesis, Photochemical reaction and e^- transport (cyclic and non-cyclic photophosphorylation), CO_2 fixation (C3 and C4 cycle), Respiration: aerobic- glycolysis, Krebs cycle, Electron transport cycle and chemiosmotic synthesis of ATP. Anaerobic respiration: lactic acid fermentation, alcohol fermentation. Pentose Phosphate Pathway (PPP). Plant growth regulators

(auxin, gibberellin cytokinin, abscisic acid and ethylene), Physiology of flowering, vernalization. Seed dormancy, physiology and biochemistry of seed germination. Biomolecules: Introduction, structure and properties of Monosaccharides, Disaccharides and Polysaccharides, Structure and properties of amino acid, protein. Structure, classification and nomenclature of enzymes, mechanism of enzyme action. Vitamins: source and deficiency symptoms of vitamin A, B, C, D, E and K. Structure and properties of simple lipids, compound lipids, and derived lipids.

UNIT IV **Ecology and Conservation Biology:** Ecological factors: climatic factors, biotic factors, edaphic factors. Plant adaptations – morphological, anatomical and physiological adaptations of hydrophytes, xerophytes and halophytes. Plant communities – Characteristic features, methods of analysis- quadrats and transect methods, units of vegetation, plant succession. Hydrosere and xerosere. Climax and its concepts. Biodiversity: types, values. Hotspot. Concepts of threatened species: characteristic of endangered species. IUCN: endangered and endemic plant species of India. Types of conservation: In situ and Ex situ methods.

UNIT V **Taxonomy and Economic Botany:** Modification of root and stem. Leaf. Types of inflorescence, flower. Floral formula, Floral diagram. Botanical nomenclature - vernacular names, binomial, principles of ICBN, herbarium techniques, vegetative, floral characters and economic importance of the following families: Annonaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Sapotaceae, Apocynaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Arecaceae, Orchidaceae, and Poaceae,

Books for Reference:

UG question bank from Botany department

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	2
CO3	2	3	2	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	2	3	3	3	2	3
Avg	2.8	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
CORE IX - BIOCHEMISTRY			
Course Code: 23UBOC61	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

COURSE OBJECTIVE

To learn about the structure and interactions present in various biomolecules that help in functioning and organization of living cell.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the types of chemical bonds involved in the structure ofbiomolecules and basic concepts of acid, base and buffer.	K1
CO2	explain about the classification carbohydrates of different domain based on their physical, chemical organization and their biological significance.	K2
CO3	construct the structure and properties of amino acids, protein andtheir role in organization of life.	K3
CO4	analyze and decipher the enzyme groups and know the nomenclaturethat enables to deduce the specificity of enzyme's action	K4
CO5	conclude the sources of vitamins and symptoms specific to vitamindeficiency in human beings.	K5

SEMESTER VI			
CORE IX - BIOCHEMISTRY			
Course Code: 23UBOC61	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I **Biomolecules:** Chemical bonds: Covalent bond, non - covalent bond, ionicbond, Van der Waals forces, hydrogen bond. pH: acid - base concept, Henderson-Hasselbach equation. Buffers: Biological buffer systems in body fluids.

UNIT II **Carbohydrates:** Definition, classification and functions. Monosaccharides: structure and properties, chirality and optical activity, stereoisomerism, absolute and relative configuration (D and L and R and S), open and cyclic structure of glucose and fructose (pyranose and furanose). Disaccharides: Structure and properties - reducing sugar (maltose), non-reducing sugar (sucrose). Polysaccharides: structure and properties. Homopolysaccharide: structural polysaccharide (cellulose), storage polysaccharide (starch). Nutritional importance of carbohydrates

UNIT III **Amino acids:** Structure, classification (based on composition and polarity of R group), physical properties and chemical reactions of amino acids. Proteins: peptide bond, Psi and Phi angle, Ramachandran plot. Structural organization of proteins: primary, secondary, tertiary and quaternary structures. Properties of protein and nutritional importance of protein.

UNIT IV **Enzymes:** Structure of enzyme: holoenzyme, apoenzyme, prosthetic group (cofactors, coenzymes). Classification and nomenclature of enzymes. Mechanism of action (activation energy, lock and key hypothesis, induced fit theory). Factors affecting enzyme activity and applications of enzymes. Vitamins: source and deficiency symptoms of vitamin A, B, C, D, E and K.

UNIT V **Lipids:** Structure, classification: simple lipids (waxes and triglycerides), compound lipids (phospholipid and glycolipid) and derived lipids (steroids, carotenoids and terpenes). Properties of lipids and nutritional importance of lipids.

Text books

1. Jain, J. L. (2005). *Fundamentals of Biochemistry.* New Delhi: S. Chand andCompany.
2. Conn, E., and Stumpf, P. K. (1979). *Outline of Biochemistry*. New Delhi: Niley EasternLtd.

Books for Reference

1. Garrett, R. G., and C. M. Grisham. (2010). *Plant Biochemistry and Molecular Biology,* John Wiley and Sons, New York.
2. Wilson, K., and Walker, J. (2000). *Biochemistry*. Mary Fimch Publishers.
3. Wilson, K., and J. Walker (Eds). (1994). *Principles and Techniques of PracticalBiochemistry (4th Edition),* Cambridge University Press, Cambridge.
4. Bendre, A.M., and Ashok Kumar. (2009). *A text book of practical Botany. Vol. I and II.*Rastogi Publication. Meerut.

MAPPING WITH PROGRAMME OUTCOMES:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	3	3	3	3
CO3	3	3	3	2	2	3	2	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	2	3	3	3	3	2	3	3	3	2
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
CORE X - MARINE BIOLOGY			
Course Code: 23UBOC62	**Hrs / Week: 4**	**Hrs. / Semester: 60**	**Credits: 4**

COURSE OBJECTIVES

1. To give elaborate account on marine environment and its role in controlling the Earth's climate.
2. To understand the different types of marine habitats, understand the role of marine products and their socio economic and environmental significance

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the importance of marine environment and classify them	K1
CO2	explain the ecological relationship between organisms and their environment	K2
CO3	classify the characteristic feature, divisions and adaptations of an organisms.	K3
CO4	analyze the ecological role and functions of an organisms.	K4
CO5	evaluate the uses of marine resources and realize the role of marine plants in the economy of the ocean	K5

SEMESTER VI			
CORE X - MARINE BIOLOGY			
Course Code: 23UBOC62	**Hrs. / Week: 4**	**Hrs. / Semester: 60**	**Credits: 4**

UNIT I **Introduction to Marine Ecology:** Importance of marine ecology. **Environmental Marine Ecology:** Divisions, Physical Factors: temperature, light, salinity, pressure, ocean currents, tides, waves, substratum, and climate change. Chemical Factors: oxygen, carbondioxides and carbonates, hydrogen sulphide, hydrogen ion concentration (pH), inorganic salts and dissolved organic matter.

UNIT II **Ocean Ecology:** Pelagic environment of the ocean, Marine organisms of the pelagic zone of the ocean. Adaptation of the pelagic organisms of the ocean. Benthic environment of the ocean: Bathyal zone, Abysal zone and hadal zone. Hydrothermal vents and cold – seep communities, Adaptation, and significance of hydrothermal vents.

UNIT III **Marine plant groups and Organisms:** Brief account on Marine Phytoplankton, Nekton and Benthos. Seaweeds and Seagrasses. Marine fungi, Actinomycetes, Lichens and Bacteria. Mangroves: distribution, types, ecology, functions and uses.

UNIT IV **Estuaries:** Definition, types, organisms and adaptation**. Salt Marshes:** Characters, development, zonation, ecological services. **Coral-Reef Ecosystem:** Importance, distribution, types, ecology, and organisms associated with reefs, interaction and ecology of reefs.

UNIT V **Marine products**: traditional uses; human food and agriculture. Marine lipids, flavonoids, and carotenoids. Marine pharmacology: identification of bioactive compounds in marine organisms mangroves, seaweeds, and sea grasses. Culture of micro algae: laboratory culture, preservation and maintenance of culture and mass culture.

Texts Books

1. Kathiresan. K 2015. Ocean *and Coastal Ecology*, Jodhpur, Rjesthan: Scientific publishers.
2. Kathiresan. K, and Rajendran N. 2016. *Mangrove Forests*. Environmental Information System (ENVIS) Centre of Advanced Study in Marine Biology. Annamalai University, Parangipettai-608 502 Tamil Nadu, India.
3. Rajakumar. R. 2005. *Coral reef.* Environmental Information System (ENVIS) Centre of Advanced Study in Marine Biology. Annamalai University, Parangipettai-608 502 Tamil Nadu, India.

Books for Reference

1. Cliton J. Dawes. 1981. *Marine Botany*. New York: A wiley, Inter sciences publication.
2. Dring, M.J. 1982. *The Biology of Marine Plants*. Australia: Cambridge University Press.
3. Elizabeth Wood, 1987. *Sub tidal Ecology*. Australia: Cambridge University Press.
4. John F. Morrissey, James L. Sumich, Deanna R. Pin kard Meier. 2018. (11th ed) *Introduction to the Biology of Marine Life*. USA: Jones and Bartlett learning company.
5. Michael, P. 1986. *Ecological methods for field and laboratory investigations*. London: Tata McGraw – Hill publishing Company Limited.
6. Sinha, P.C. 1998. *Marine pollution*, New Delhi: Anmol publications Pvt. Ltd.
7. Tait, R.V. 1978. *Elements of Ecology*. London: Butter worths.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	3	3	2	3	2	3	2	3
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3	2.8	3

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
CORE XI - ECOLOGY AND PHYTOGEOGRAPHY			
Course Code: 23UBOC63	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

OBJECTIVE

To impart knowledge on environment, conserve the nature and analyse the vegetation.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the structure of soil, types of vegetation and forest, phytogeographic regions, centers of origin of cultivated plants.	K1
CO2	discuss properties of soil, origin and formation of soil, continental drift, endemism.	K2
CO3	explain soil erosion, quadrat and transect method analysis of vegetation, use of remote sensing in vegetative analysis and GIS.	K3
CO4	analyze the soil profile, adaptation of hydrophytes, xerophytes and halophytes.	K4
CO5	recommend methods for soil conservation, vegetation analysis.	K5

SEMESTER VI			
CORE XI - ECOLOGY AND PHYTOGEOGRAPHY			
Course Code: 23UBOC63	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 4**

UNIT I **Soil:** types based on texture, soil profile, physical and chemical properties of soil, origin and formation of soil, physical, chemical and biological weathering, soil erosion and its conservation.

UNIT II **Interaction between plants:** positive and negative interactions. Study of plant communities: units of vegetation, quadrat and transect method analysis, importance and significance of field methods.

UNIT III Study of hydrophytes, xerophytes and halophytes with reference to morphological, anatomical and physiological adaptations. Plant succession: types, causes, hydrosere.

UNIT IV **Vegetations and forest types in Tamil Nadu:** evergreen, deciduous, scrub jungle. Use of remote sensing in vegetative analysis and GIS, Endangered plants of India

UNIT V **Phytogeography:** principles, phytogeographic regions, patterns of distribution, continental drift, endemism. Centers of origin of cultivated plants (Rice, Potato, Sugarcane).

Text books

1. Sharma, P. D. (1999). *Elements of ecology*. Rastogi Publications, Shivaji Road, Meerut.
2. Shukla, R. S., and Chandal, S. S. (1991). *Plant Ecology*. S. Chandal and Co., New Delhi.

Books for Reference

1. Asthana, and Meera Asthana. (2001). *Environmental problems and solutions.* S. Chand and Co. Ltd., New Delhi.
2. Dash, M. C. (2001). *Fundamentals of ecology*. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Murugesan, A. G., and Rajakumari. (2005). *Environmental Science and Biotechnology, theory and Techniques*. M.J.P. Publishers, Chennai.
4. Trivedi, P. R., Sharma, P. L., and Sundarshan, K. N. (1994). *Natural environment and Constitution of India*. Efficient Offset Printers, New Delhi.
5. Tyller Miller, G. (2004). *Environment Science*. Thompson Brooks/Cole, Singapore.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	2	2	2	2	3	3
CO3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	2	3	3	3
Avg	3	2.8	2.8	2.8	2.8	2.8	2.6	2.8	3	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
CORE PRACTICAL VII – BIOCHEMISTRY PRACTICAL			
Course Code: 23UBOCR7	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credit: 1**

COURSE OBJECTIVE

To acquire practical knowledge regarding the techniques used to investigate the properties of macromolecules.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the preparation and estimations of primary metabolites.	K1
CO2	explain about the extraction and separation of column chromatography.	K2
CO3	construct the use of various primary metabolites.	K3
CO4	analyze and decipher the significance of saponification value.	K4
CO5	conclude the devise innovative methods for estimate value of primarymetabolites.	K5

SEMESTER VI			
CORE PRACTICAL VII – BIOCHEMISTRY PRACTICAL			
Course Code: 23UBOCR7	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credit: 1**

EXPERIMENTS

1. Preparation of acetate buffer
2. Estimation of total sugar (phenol sulphuric acid method)
3. Estimation of free amino acid from plant tissues (Ninhydrin method)
4. Separation of amino acids (ascending paper chromatography)
5. Separation of photosynthetic pigments (column chromatography).
6. Absorption spectrum of pigments
7. Study of enzyme kinetics and determination of Km value.
8. Saponification value of two vegetable oil.
9. Enzyme assay – Protease
10. Spotters related to biochemistry
    - Submission of record

References

1. Jayaraman J. (2001). *Laboratory manual in Biochemistry.* New Delhi: New Age International publisher.
2. Plummer, D. (1988). *An introduction to Practical Biochemistry,* Tata McGraw–Hill Publishing Company Ltd., New Delhi.
3. Palanivelu, P. (2004). *Laboratory Manual for analytical biochemistry and separation techniques,* School of Biotechnology, Madurai Kamaraj University, Madurai.

MAPPING WITH PROGRAMME OUTCOME:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	2	3	3	2
CO3	2	3	3	3	3	2	3	3	2	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
CORE PRACTICAL VIII - MARINE BIOLOGY, ECOLOGY AND PHYTOGEOGRAPHY PRACTICAL			
Course Code: 23UBOCR8	**Hrs. / Week: 4**	**Hrs. / Semester: 60**	**Credits: 2**

COURSE OBJECTIVE

To understand the adaptation of plants to their habitats**.**

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the morphological structure of hydrophytes, xerophytes, halophytes, sea weeds, sea grasses.	K1
CO2	explain the properties, mineral content of soil and water	K2
CO3	demonstrate the ecology and marine biology experiments	K3
CO4	analyze the adaptation of plants and compare the anatomical and morphological difference between hydrophytes and xerophytes.	K4
CO5	infer the experimental results and depict the adaptation with digrams	K5

SEMESTER VI			
CORE PRACTICAL VIII - MARINE BIOLOGY, ECOLOGY AND PHYTOGEOGRAPHY PRACTICAL			
Course Code: 23UBOCR8	**Hrs. / Week: 4**	**Hrs. / Semester: 60**	**Credits: 2**

ECOLOGY AND PHYTOGEOGRAPHY

1. Determination of soil pH (at least 3 types of soil)
2. Determination of soil texture.
3. Determination of soil moisture.
4. Determination of soil bulk density.
5. Determination of soil porosity.
6. Determination of soil organic matter content.
7. Sectioning of hydrophytes, xerophytes and halophytes,
8. Analysing vegetation by quadrat method
9. Mapping of vegetation of India
10. Mapping of forest types

MARINE BIOLOGY

1. Estimation of acidity
2. Estimation of alkalinity
3. Estimation of Salinity
4. Estimation of total hardness
5. Estimation of nitrate (Spectrophotometry)
6. Estimation of Phosphate (Spectrophotometry)
7. Estimation of Sodium (Flame Photometer)
8. Estimation of Potassium (Flame Photometer)
9. Estimation of Particulate Organic Matter.

Specimens / photographs / charts

1. Navigational Devices: Operation and application of GPS, Thermometer, Hygrometer, Anemometer and Lux Meter.
2. Plankton net
3. Seaweeds
4. Sea grasses
5. Mangroves

Field visit: No of days: 2 (Collection of Algae and Observation of different shores and Mangroves)

Submission: Record Note, 5 Herbarium and Field Report.

Reference

1. Darell Vodopich, (2009). *Ecology lab manual*. Mc Graw Hill.New York:
2. Strickland. J.D.H. and Parson. T. R A 1972. *Practical Hand Book of Sea Water Analysis*. Fisheries Research Board of Canada.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	2	3	3	3	3	3	3
CO3	2	2	3	3	2	3	2	3	2	3
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	3
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3	2.8	3

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
DISCIPLINE SPECIFIC ELECTIVE II - BIOTECHNOLOGY			
Course Code: 23UBOE61	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 3**

COURSE OBJECTIVE

To introduce the students to the various developments and applications of biotechnology and to train students on basic molecular biology techniques

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the basic principles in tools and techniques of biotechnology and its applications in light of regulations in biotechnology	K1
CO2	discuss the tools and methods of biotechnology needed to develop transgenic plants for various applications	K2
CO3	relate the various techniques of recombinant DNA technology in the applications of plant biotechnology in environment and other areas.	K3
CO4	analyze the recombinant DNA techniques used in the production of transgenic plants and intellectual property rights issues in biotechnology.	K4
CO5	evaluate and develop skills for effective utilization biotechniques and recombinant techniques for the production of plant-based products and regulations in biotechnology.	K5

SEMESTER VI			
DISCIPLINE SPECIFIC ELECTIVE II - BIOTECHNOLOGY			
Course Code: 23UBOE61	**Hrs/ Week: 4**	**Hrs/ Semester: 60**	**Credits: 3**

UNIT I Biotechnology: History, scope, potentialities and constrains. **Gene cloning vectors:** Plasmids, Phasmids, Cosmids, Yeast Artificial Chromosomes (YAC) and expression vectors. **Enzymes in genetic engineering**: exonucleases, endonucleases, restriction endonucleases, SI nucleases, DNA ligases and reverse transcriptase

UNIT II Preparation of desired DNA, *in vitro* construction of rDNA: methods to construct rDNA, application of rDNAs. **Gene transfer methods:** Direct – physical (electroporation, particle bombardment and microinjection), chemical (liposome, DEAE dextran and calcium phosphate). Indirect – *Agrobacterium* mediated.

UNIT III **Gene cloning strategies:** definition, genomic DNA library, Screening of DNA library, cDNA libraries, creation of cDNA library. **Selection (Screening) of recombinants:** definition, selection of recombinant bacteria and plants. Selection for antibiotic resistance gene and tumorous growth, reporter genes, blotting techniques. **Expression of cloned genes:** expression of eukaryotic genes in prokaryotes.

UNIT IV **Transgenic plants:** Insect resistance, disease resistance, herbicide resistance. **Transgenic plants as bioreactors:** production of antibodies (plantibodies), vaccinesand therapeutic proteins in plants. **Bioremediation**: degradation of xenobiotics (hydrocarbons and pesticides). Role of genetically engineered microbes in biomining and bioleaching.

UNIT V **Regulations in Biotechnology:** definition, requirement of biosafety in transgenic research, biosafety guidelines and implementation. **Intellectual property rights:** world organisations, forms of protection (copyright, trademark and patent). Plant variety protection in India. Farmer's Rights and plant breeder's Rights.

Text Books

1. Chawla, H.S. (2009). *Introduction to Biotechnology*, 2nd edn. Oxford IBH.
2. Das H.K. (2017). *Text Book of Biotechnology*. Wiley; Fifth edition.
3. Dubey R.C. (2005). *Textbook of Biotechnology*. New Delhi: S. Chand and Co.
4. Sathyanarayana U. (2006). *Biotechnology.* Kolkatha: Book sand Allied (P). Ltd.
5. Singh B. D. (2018). *Plant Biotechnology.* Kalynai Publishers, New Delhi.

Books for Reference

1. Abdin, M.Z., Kiran, U., Kamaluddin, M., and Ali, A. (Eds.). (2017). *Plant Biotechnology: Principles and Applications.* Springer publishers.

2. Rattledge, C., and Bjon, K. (2001). *Basic biotechnology*. New York: Cambridge University Press.
3. Gupta, P.K. (2000). *Elements of Biotechnology.* Meerut: Rastogi publication.
4. Kumar, H.D. (1993). *Molecular biology and Biotechnology*. New Delhi: Vikas publishers.
5. Mba, C., Afza, R., Bado, S., and Jain, S.M. (2010). *Plant Cell Culture: Essential Methods*. John Wiley and Sons, UK.
6. Mukhopadhyay, S.N., Sharma, P., and Narain, R. (2011). *A text book of DNA recombinant technology.* New Delhi: Wisdom press.

MAPPING WITH PROGRAMME OUTCOMES:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	2	3	3	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	2	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3
Avg	3	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
DISCIPLINE SPECIFIC ELECTIVE II - ENTREPRENEURIAL BOTANY			
Course Code: 23UBOE62	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 3**

COURSE OBJECTIVE

To learn about the students to develop innovative ideas to exploit the economically useful plant products for commercial purposes. To gain knowledge about the entrepreneurial values to start a new business.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	recall the significance of government agencies for entrepreneurship development, communication process, bio products, different agencies and product marketing.	K1
CO2	explain about the entrepreneurial values, risk assessment and solutions, details of various products, different government schemes and IPR.	K2
CO3	construct the use of entrepreneurial opportunities, various case study, filing patents and different agencies.	K3
CO4	analyze and decipher the significance of bio venture and value-added products, project proposal and preparation of SLF.	K4
CO5	conclude the devise innovative methods for making value added products, business planning and marketing.	K5

SEMESTER VI			
DISCIPLINE SPECIFIC ELECTIVE II - ENTREPRENEURIAL BOTANY			
Course Code: 23UBOE62	**Hrs / Week: 4**	**Hrs / Semester: 60**	**Credits: 3**

UNIT I **Introduction:** Need - definition and concept - Types and characterization - entrepreneurial values-motivation and barriers-entrepreneurship as innovation, risk assessment and solutions. Communication - power of talk, personal selling, risk taking, resilience and negotiation. Case study and biographical analysis of successful entrepreneurs.

UNIT II **Bioventure:** Industry-overview of *Spirulina*, *Pleurotus*, Natural dyes, Banana fibers, Wine, Hydroponics, Drumstick and coconut-Straight Vegetable Oil (SVO) and Pure Plant Oil (PPO) - methods and marketing - fresh and dry flowers for aesthetics.

UNIT III **Value Added Products:** Bamboo and cane-based products-virgin coconut oil, jasmine oil-nutraceuticals-standards and quality management. **Aromatic plants-essential oils:** Medicinal plants-cultivation and extraction, seaweed liquid fertilizers, organic farming and their products - Bonsai, Ikebana.

UNIT IV **Organizations and Agencies:** Mobilizing resources for start-up-financial assistance by different agencies. TIIC, DIC, NABARD, MICROSTAT, DBT - case study-Sarvodaya-SIDCO-Micro Small and Medium Enterprises-support structure for promoting entrepreneurship-various government schemes.

UNIT V **Entrepreneurial Opportunities:** Understanding a market and assessment, selection of an enterprise, business planning, mobilization of resources, Break Even Analysis, project proposal (guidelines, collection of information and preparation of project report), steps in filing patents, trademarks and copyright, Intellectual Property Rights, export and import license.

Text Books

1. Desai, V. (2015). *Entrepreneurship development, First Edition*. Himalaya publication house, Mumbai. ISBN: 9789350973837.
2. Gorden, E., and Natarajan, K. (2018). *Entrepreneurship Development*, Himalaya Publishing House, Mumbai. ISBN: 978-5202-540-4.
3. Khanna, S. S. (2016). *Entrepreneurial development*. S. Chand company limited, New Delhi. ISBN: 9788121918015.

Books for Reference

1. Manohar, D. (1989). *Entrepreneurship of small-scale Industries, vol. III.* Deep and deep publication, New Delhi. ISSN: 09735925.
2. Lal, G., Siddhapa, G.S., and Tandon, G.L. (1988). *Preservation of fruits and vegetables.* Indian Council of Agricultural Research (ICAR). ISSN: 0101-2061.
3. Ranganna, S. (2001). *Handbook of analysis and quality control of fruits and Vegetable products, Second edition,* Tata Mc Graw hill, New Delhi. ISBN: 780074518519.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	2	3	3	2	3	3	2
CO3	2	3	3	3	3	2	3	3	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3
Avg	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3	2.8	2.8

S-Strong (3) **M-Medium (2)** **L-Low (1)**

SEMESTER VI			
SKILL ENHANCEMENT COURSE VI – BASICS OF BIOINFORMATICS			
Course Code: 23UBOSE6	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

COURSE OBJECTIVE

To develop interdisciplinary skills in using computers in botany to learn about the biological database with the most recent technologies for sequencing and bioinformatics analysis.

COURSE OUTCOMES

CO. No.	Upon completion of this course, students will be able to	PO
CO1	retrieve advanced resources for accessing data from the internet.	**K1**
CO2	explain the concept of databases and use of different public domain for DNA and proteins sequence retrieval.	**K2**
CO3	apply various software resources with advanced functions to carry out analysis of data procured through research.	**K3**
CO4	analyze alignment of sequences and drug design.	**K4**
CO5	evaluate the tools for structure prediction and visualization.	**K5**

SEMESTER VI			
SKILL ENHANCEMENT COURSE VI – BASICS OF BIOINFORMATICS			
Course Code: 23UBOSE6	**Hrs / Week: 2**	**Hrs / Semester: 30**	**Credits: 2**

UNIT I **Introduction to bioinformatics:** History of bioinformatics, applications of bioinformatics, scope of bioinformatics, bioinformatics in business. Bioinformatics and its and its relation with molecular biology. The Human Genome Project, Bioinformatics and Human diseases. General purpose search engine: Google.

UNIT II **Databases:** Biological data bases: types – primary, secondary and compositae databases; nucleotide sequence databases – NCBI (GenBank), EMBL, DDBJ; Protein sequence databases – SWISS-PROT, PIR; Protein structure database – PDB; bibliographic database – PubMed, PMC, PloS.

UNIT III **Sequence analysis:** Sequence analysis tools – BLAST and FASTA. Molecular visualization tool – RASMOL (basic commands), sequence alignment – scoring matrices, global and local alignment – CLUSTAL W and CLUSTAL X.

UNIT IV **Molecular phylogeny:** Homologs, orthologs and paralogs, phylogenetic tree –rooted and unrooted, Tree-Building Methods, Distance, Parsimony and Maximum Likelihood, Advantages of phylogenetic tree, Use of PHYLIP software.

UNIT V **Drug Design:** Review of basic biological concepts-Diseases and their causes-molecular basis of diseases, Immunology, Characteristics of a drug compound, Target identification and validation, Lead compound identification, Molecular Visualization tool: RASMOL, Drug designing software: Ligand explorer.

Text books

1. Narayanan, P., (2006). *Bioinformatics: A Primer.* New Age International Publishers.
2. Irfan Ali Khan, and Atiya Khanum, (2003). *Fundamentals of Bioinformatics*. Ukaaz Publications.
3. 3. Mani, K., and Vijayaraj, (2002). *Bioinformatics for Beginners*. Kalaikathir Achagam.

Books for reference

1. Andreas, D., Baxevanis, B.F., Francis, and Ouellette, (2004). *Bioinformatics: A practical guide to the analysis of genes and proteins* (3rd edition). New Jersey, U.S: John Wiley and Sons.
2. Attwood, T.K., and Parry-Smith, D.J. (2014). *Introduction to bioinformatics.* New York: Pearson Education Publishers.
3. Baxevanis, A.D., and Ouellette, B.F., John, (2005). *Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins* (3rd edition). New Jersey, U.S: Wiley and Sons.
4. David, W., and Mount, (2004). *Bioinformatics Sequence and Genome Analysis*. 2nd Edition. New York, US: Cold Spring Harbor Laboratory Press.
5. Ghosh, Z., and Mallick, B. (2008). *Bioinformatics – Principles and Applications* (1st edition). Delhi: Oxford University Press.
6. Gibas, C., and Jambeck, P. (1999). *Developing Bioinformatics Skills.* New York, U.S: O'Reilly Shroff Publishers and Distributors Private Limited.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	2	2	3	3	2
Avg	3	3	3	2.8	3	2.8	2.8	3	3	2.8

S-Strong (3) M-Medium (2) L-Low (1)