VIVEKANANDA COLLEGE

College with Potential for Excellence
(Residential & Autonomous – A Gurukula Institute of Life-Training)
(Affiliated to Madurai Kamaraj University)
Reaccredited with 'A' Grade (CGPA of 3.59 out of 4.00) by NAAC

TIRUVEDAKAM WEST

MADURAI DISTRICT – 625 234

DEPARTMENT OF BOTANY

B.Sc. BOTANY

Learning Outcomes based Curriculum Framework (LOCF)

Choice Based Credit System

(For those students admitted during the Academic year 2022 – 2023 and after)

VIVEKANANDA COLLEGE

Tiruvedakam West, Madurai District-625234, Tamil Nadu

(For those students admitted during the Academic year 2022 – 2023 and after)

VISION

To meet the growing global needs by educating students to excel in botany with a human touch.

MISSION

The mission is to give very good learning experience in understanding basics of botany and lab techniques with professional excellence and also produce academically proficient, professionally competent and socially responsible graduates in Botany.

ABOUT THE DEPARTMENT

Botany is the subset of biology that specifically focuses on plants which are correspondingly the reservoir of novel natural products. Many of the natural products that they produce are useful to humans. Besides foodstuff, plants are the resources for other human requirement like medicines, papers, furniture, fabrics, etc. Therefore the study of plants is very significant for sustainable life. The visionaries of the college are met with the requirements of this peculiar subject in the higher educational institutions. Thus evergreen Botany department has come into existence in Vivekananda College.

The Botany Department started in the year 1982 with UG & Allied Botany. Since the beginning of the course the faculty members are experts in the fields of Botany viz. Mycology, Herbal Botany, Biotechnology, Microbiology, Tissue culture, etc.

In order to create job opportunities and entrepreneurs moreover smart soft skills to the students, two separate well equipped microbiology and tissue culture laboratories with sufficient chemicals and sophisticated instruments such as S*tudents microscope, Binocular microscope, Laminar Air Flow, tissue/bacterial Culture chambers, Autoclave, Environmental shaker with incubator, Hot air oven, Colorimeter, pH meter, Digital balance, Microcentrifuge, Electrophoresis Colony counter, Smart class rooms, etc.* The department has sound stock of herbarium and collection of digital resources for teaching and learning process. The department library facilitates the students to locate their reference materials. Till date, the library has nearly **2340** books with national & international standard. Moreover, we have CSIR-JRF/NET & SET EXAM assisted recent edited books like Molecular Cell Biology by Lodish et al., Biochemistry by Stryer et al., Developmental biology by Gilbert, Plant Physiology by Lincoln Taiz et al., etc. & Selected books. The learners get opportunities such as filed visits and industrial trips to enrich their knowledge and meet their urge in this competitive learning environment.

The department provides zoology and chemistry as allied subjects. Undergraduate students have Non Major Elective courses in their programme. Apart from the core curriculum, the department also offers a number of extra certificate courses such as Horticulture and Medicinal Botany, etc.

Under the shadow of Swamy Botanical Association (SBA), students meet, expert lectures and various other student development programmes has been benefitted for the students. Several experts from national/regional institutions have frequently visit and deliver

lectures on inevitable topics in the emerging fields of Botany and interdisciplinary streams. SBA, an association of students, is also functioning with following objectives:

- To maintain Herbal and Ornamental garden in the College Campus
- To train the students to prepare herbal formulations
- To exhibit the details of all flora in college campus

Prof S. RAJARAM served the dept. as founder HOD for the longest term (35 years) and retired in the year 2013. Prof G.SENTHILKUMAR rendered his service as Associate Professor for nearly three decades and retired in the year 2014. Dr P.T. MANOHARAN had elected to Madurai Kamaraj University as Academic Council, Senate and Syndicate Member and worked as an Additional Controller of Examination in DDE, MKU, earned name and fame to our Department and to the institution. Both Dr P.T. MANOHARAN and Dr. N. LAKSHMANAN were recognized supervisors for guiding PhD scholars and retired in the year 2016 and 2019 respectively. Dr. V. RAMESH and Dr. T. SELLATHURAI are also recognized supervisor for guiding PhD scholars and Dr. V. RAMESH has received Summer Research Fellowship from Indian Academies of Sciences viz. INSA, IASc and NASI, received Lecture workshop grant worth of Rs.149,000/- from Indian Academies of Sciences viz. INSA, IASc and NASI, and Best Young Faculty Award by Novel Research Academy. Recently he has selected for Young Scientist Fellowship from TNSCST, Chennai during the academic year of 2019-2020. The faculty members are contributing to the academic field by editing journals & Books. They have been on the editorial boards and acted as referees in the academic journals.

ABOUT THE PROGRAMME

This programme includes (a) Part I Tamil & Sanskrit (which can be chosen by the interest of the students) and Part II English (b) Core courses include Discipline Specific Elective and Ability Enhancement Course (c) Skill Enhancement courses (d) Value Education (e) Environmental studies and (f) Generic Elective Course. No course shall carry more than 5 credits. The student shall select any one of the Choice-based credit courses have offered by the department through their interest on studies.

The programme contains 43 courses in six semesters. The total credit of the programme is 140. The programme contains 3 Discipline Specific Elective include Project and Viva-voce, Ability Enhancement Courses and skill Enhancement courses from the relevant subjects for complementing the core of study. There should be 4 common courses that include the first and second language besides an environmental study and an extension activities course.

Programme Educational Objectives (PEOs)

Under graduates of B.Sc Botany program will be

PEO 1	Know about the core concepts in the subject namely the plant kingdom and impart quality education to meet the demands of higher education and Research in Botany
PEO 2	Exhibit proficiency in selected laboratory skills
PEO 3	Using entrepreneurial skills with botanical Knowledge to shine in their profession
PEO 4	Develop a competitive edge among the students to meet out their employability
PEO 5	Make use of knowledge in the field of horticultural, Mushroom, and Medicinal botany in their day today life.

Programme Outcomes (POs)

On completion (after three years) of B.Sc. Botany Programme, the students are expected to

P.No.	Programme Outcome	Description
PO1	Disciplinary Knowledge and Critical Thinking	Take informed actions after identifying the assumptions that frame our thinking and actions, checking out degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from perspectives.
PO2	Effective Communication and Digital Literacy	Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people , ideas, books, media and technology.
PO3	Social Interaction and Problem Solving	Elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO4	Effective Citizenship and Social Responsibility	Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering and life training.
PO5	Professional Ethics and Human Values	Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6	Environment and Sustainability	Understand the issues of environmental contexts and Sustainable development.
PO7	Self –directed and life – long learning	Acquire the ability to engage in independent and life – long learning in the broadest context socio- technological changes

Programme Specific Outcomes (PSOs)

PSO 1	To provide knowledge regarding Plant kingdom from primitive to advance
PSO 2	To inculcate the importance of biodiversity conservation and sustainable use of biodiversity to the students
PSO 3	To highlight the potential of plant science to become an entrepreneur
PSO 4	To kindle the interest of higher studies and research in Botany
PSO 5	To facilitate the students for taking up and shaping a successful career in botany

Graduate Attributes (GA)

No.	Attribute	Description
GA 1	Scientific Knowledge	Apply the knowledge of mathematics, science, arts and humanities fundamentals to the solution of complex problems in the day-to-day life.
GA 2	Problem Analysis	Identify, formulate, research literature, and analyse complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences and social sciences by using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
GA 3	Problem Solving	Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
GA 4	Modern Tool Usage	Create, select, and apply appropriate techniques, resources, and modern economics theories including principles and modelling to complex economic activities with an understanding of the limitations.
GA 5	Graduate and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the social practice.
GA 6	Environment and sustainability	Understand the impact of the solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
GA 7	Ethics and Values	Apply ethical principles, commit to professional ethics, responsibilities and norms of the life through value oriented life training.
GA 8	Leadership Quality	Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
GA 9	Communication	Communicate effectively on complex economic activities with the economics community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
GA 10	Project management and Finance	Demonstrate knowledge and understanding of the economics and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
GA 11	Life Long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
GA 12	Entrepreneurial Skills	Create confidence to become an entrepreneur by providing entrepreneurial skills and technical skills.
GA 13	Harmonious Development of Individual	Make an individual as perfect man through the harmonious development of physical, emotional and intellectual cultures.

Mapping of PEO with PO

	PO 1	PO 2	PO 3	PO 4	PO 5
PEO 1					
PEO 2					
PEO 3					
PEO 4					
PEO 5					

Mapping of PO with GA

	GA 1	GA 2	GA 3	GA 4		GA 5		GA 6		GA 7	GA 8	GA 9	GA 10
PO 1													
PO 2													
PO 3													
PO 4													
PO 5													

ASSESSEMENT (Pattern – CIA & ESE)

Distribution of questions and marks

Bloom's Taxonomy	**CIA**					**ESE**				
	Part-A	**Part-B**	**Part-C**	**Part-D**	**Total**	**Part-A**	**Part-B**	**Part-C**	**Part-D**	**Total**
Knowledge	10×1=10				(50 marks converted in to 15 marks + Assignment 5 marks + Cycle test 5 marks) **Total 25 marks**	10×1=10	5 out of 7 5×2= 10			(**Total 75 marks**)
Understand		5 out of 7 5×2= 10	3 out of 5 3×6= 18					5×5= 25 (a or b)		
Apply				1 out of 2 1×12=12					3 out of 5 3×10= 30	

CIA - Continuous Internal Assessment; **ESE** – End Semester Examination

Note: figures in the parenthesis are marks

SCHEME OF EXAMINATION

FIRST SEMESTER

Part	Study Component	Subject Code	Title of the Paper	Hours	Credit	CIA Marks	ESE Marks	Total
I	Tamil	P1LT11	Ikkalak Kavithaiyum Urainadaiyum	6	3	25	75	100
	Sanskrit	P1LS11	Fundamental Grammar & History of Sanskrit Literature – I					
II	English	P2LE11	General English - I	6	3	25	75	100
III	Core Course	08CT11	Algae and Bryophytes	4	4	25	75	100
	Core Course	08CT12	Fungi and Plant Pathology	4	4	25	75	100
	Core Course	08CP23	Core Practical - I	2	-	-	-	-
	AEC	07ATB1	Allied Paper I : Chemistry for Biologist – I	4	4	25	75	100
	AEC		Allied: Volumetric Estimation	2	-	-	-	-
IV	GEC	08NE11	Non Major Elective Paper I : Energy Resources	2	2	25	75	100
			TOTAL	**30**	**20**			

SECOND SEMESTER

Part	Study Component	Subject Code	Title of the Paper	Hrs	Crd.	CIA Marks	ESE Marks	Total
I	Tamil	P1LT21	Ikkalak Kadhai Ilakkiyamum Makkal Thagavaliyalum	6	3	25	75	100
	Sanskrit	P1LS21	Poetry, Grammar & History of Sanskrit Literature – II					
II	English	P2LE21	General English – II	6	3	25	75	100
III	Core Course	08CT21	Pteridophytes, Gymnosperms and Paleobotany	4	4	25	75	100
	Core Course	08CT22	Plant Anatomy and Microtechniques	4	4	25	75	100
	Core Course	08CP23	Core Practical – I	2	4	40	60	100
	AEC	07ATB2	Chemistry for Biologist - II	4	4	25	75	100
	AEC	07APB3	Volumetric Estimation	2	2	40	60	100
IV	GEC	08NE21	Non Major Elective Paper II : Gardening	2	2	25	75	100
			TOTAL	**30**	**26**			

THIRD SEMESTER

Part	Study Component	Subject Code	Title of the Paper	Hours	Credit	CIA Marks	ESE Marks	Total
I	Tamil	P1LT31	Kappiyamum Pakthi Ilakkiyamum Nadagamum	6	3	25	75	100
I	Sanskrit	P1LS31	Prose, Poetics & History of Sanskrit Literature – III					
II	English	P2LE31	English for Academic and Professional Excellence–I	6	3	25	75	100
III	Core Course	08CT31	Biochemistry, Biophysics & Biometrics	4	4	25	75	100
	Core Course	08CT32	Genetics & Bioinformatics	4	4	25	75	100
	Core Course	08CP43	Core Practical – II	2	-	-	-	-
	AEC	09AT01	Allied Paper I : Animal Organisation	4	4	25	75	100
	AEC		Allied: Practical	2	-	-	-	-
IV	SEC	08SB31	Skill Based Course I: Bio-Analytical Techniques	2	2	25	75	100
			TOTAL	**30**	**20**			

FOURTH SEMESTER

Part	Study Component	Subject Code	Title of the Paper	Hrs	Crd.	CIA Marks	ESE Marks	Total
I	Tamil	P1LT41	Sanga Ilakkiyamum Neethi Ilakkiyamum	6	3	25	75	100
	Sanskrit	P1LS41	Drama and History of Sanskrit Literature – IV					
II	English	P2LE41	English for Academic and Professional Excellence - II	6	3	25	75	100
III	Core Course	08CT41	Cell Biology and Embryology	4	4	25	75	100
	Core Course	08CT42	Plant Ecology	4	4	25	75	100
	Core Course	08CP43	Core Practical – II	2	4	40	60	100
	AEC	09AT02	Biology and Human Welfare	4	4	25	75	100
	AEC	09AP03	Allied : Practical	2	2	40	60	100
IV	SEC	08SB41	Skill Based Course II: Horticulture and Plant Breeding	2	2	25	75	100
			TOTAL	**30**	**26**			

FIFTH SEMESTER

Part	Study Component	Course Code	Title of the Paper	Hours	Credit	CIA Marks	ESE Marks	Total
III	Core Course	08CT51	Taxonomy of Angiosperms & Economic Botany	6	4	25	75	100
	Core Course	08CT52	Plant Physiology	5	4	25	75	100
	Core Course	08CT53	Microbiology	6	4	25	75	100
	Core Course	08CP62	Core Practical – III	4	-	-	-	-
	DSE	08EP5A 08EP5B	Elective – I : Medicinal Botany Elective – II: Organic farming	5	5	25	75	100
IV	SEC	08SB51	Skill Based Course – III : Mushroom Cultivation	2	2	25	75	100
	ES	ESUG51	Environmental Studies	2	2	25	75	100
			TOTAL	**30**	**21**			

SIXTH SEMESTER

Part	Study Component	Course Code	Course Title	Hrs	Credit	CIA Marks	ESE Marks	Total
III	Core Course	08CT61	Plant Biotechnology	5	4	25	75	100
	Core Course	08CP62	Core Practical - III	6	4	40	60	100
	DSE	08EP61	Project Work and Viva -Voce	6	5	--	100	100
	DSE	08EP6A	Biodiversity Conservation and Management	5	5	25	75	100
		08EP6B	Botanical Entrepreneurship					
IV	SEC	08SB61	Skill Based Course: IV Botany for Competitive Examinations	2	2	25	75	100
	SEC	08SB62	Skill Based Course: V Remote Sensing and GIS	2	2	25	75	100
	SEC	08SB63	Skill Based Course: VI Nanobiology	2	2	25	75	100
	VE	VEUG61	Value Education	2	2	25	75	100
V	EA	EAUG61	Extension Activities		1	25	75	100

			TOTAL	**30**	**27**			
			TOTAL		**140**			

Note: Practical Examinations – 08CP23- 4Hrs; 08CP43 - 4Hrs ; 08CP62- 4Hrs ; 08AP03- 4Hrs

Note:
CC: Core Course, **AEC:** Ability Enhancement Course, **SEC:** Skill Enhancement Course, **DSE:** Discipline Specific Elective, **GEC:** Generic Elective Course

GUIDELINES FOR PROJECT

The final year students should undergo a project work during VI semester

- Students are divided into groups and each group is guided by a mentor.
- The group should not exceed five students, also interested student can undergo individually.
- A problem is chosen, objectives are framed, and data is collected, analyzed and Documented in the form of a project report/Dissertation
- Viva – Voce is conducted at the end of this semester, by an external examiner and concerned mentor (Internal Examiner).
- Project work constitutes 100 marks external only.

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Theory		SEMESTER - I
Course Title: Algae and Bryophytes		
Course Code: 08CT11	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire knowledge on classification of algae and bryophytes
- To understand their structure and reproduction
- To identify the algae and bryophytes and know their economic importance

Course Outcomes (CO)

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (according to Bloom's Taxonomy)**
CO1	To acquire the characteristics of algae and economic values	K1, K2 & K3
CO2	To differentiate the morphology and reproductions of algae	K1, K2 & K3
CO3	To compare the structure and life cycle of algae	K1, K2 & K3
CO4	To remember the general features and economic importance of Bryophytes	K1, K2 & K3
CO5	To learn the structure of bryophytes and its reproduction	K1, K2 & K3

K1-knowledge **K2-**Understand **K3-**Apply

Syllabus

UNIT No.	**CONTENT**	**HOURS**
Unit-I	General Characteristics of Algae - F.E. Fritsch (1945) classification Algae (class level only), Economic importance of algae in agriculture, environment, medicine and industries	**12**
Unit- II	Structure and reproduction of the following a. Chlorophyceae - *Oedogonium* b. Xanthophyceae - *Vaucheria* c. Bacillariophyceae - Diatoms	**12**
Unit- III	Structure and reproduction of the following a. Phaeophyceae - *Sargassum*,	**12**

	b. Rhodophyceae - *Polysiphonia*, c. Cyanophyceae – *Nostoc*	
Unit-IV	General Characteristics Bryophytes - Classification of Bryophytes (G.M. Smith, 1955) – Economic importance of Bryophytes	**12**
Unit- V	Structure and reproduction of following a. Hepaticopsida - *Marchantia* b. Anthocerotopsida - *Anthoceros* c. Bryopsida - *Funaria*	**12**

Mapping of CLO with PLO

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**
CLO 1	9	9	3	3	3	9	3
CLO 2	9	9	3	3	9	9	3
CLO 3	9	9	3	3	9	9	3
CLO 4	9	1	1	3	3	9	3
CLO 5	9	3	3	3	1	9	3

9-Strong **3-**Medium **1-**Low

Mapping of CLO with PSO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CLO 1	9	9	9	9	9
CLO 2	9	9	9	9	9
CLO 3	9	9	9	9	9
CLO 4	9	9	3	3	3
CLO 5	9	9	3	3	3

9-Strong **3-**Medium **1-**Low

Text Books:

1. Botany for Degree Students Algae – P.C. Vashishta, S.Chand & Company Ltd, Delhi, 2014 Ed.
2. An Introduction of Bryophyta - A Prashid, VIKAS Publishing House PVT Ltd, New Delhi, 2018 Ed.
3. Botany for Degree Students Bryophytes - P.C. Vashishta, S.Chand & Company Ltd, Delhi, 2014 Ed.

Reference Books:

1. Algae – O.P. Sharma, McGraw Hill Education (India) PVT, Ltd., New Delhi, 2016 Ed.
2. College Botany – Ganfule Hirendra (Chandra) Vol. I, New centre book agency, London, 2013 Ed.

3. Biodiversity - V Singh, P.C. Pande and D.K. Jain, Rastogi Publications, Meerut, 2018 Ed

Online Resources:

1. https://www.slideshare.net/gkumarimahesh/algae-115147367 (Algae)
2. https://www.slideshare.net/VaniYadla/oedogoniumyv-autosavedyvppt (*Oedogonium*)
3. https://www.slideshare.net/sajigeorge64/general-characters-of-rhodophyceae-life-cycle-of-polysiphonia (*Polysiphonia*)
4. https://www.slideshare.net/vivekaiden/algae-sargassam-porphyra-and-diatoms (*Sargassum*)
5. https://www.slideshare.net/Eva983/the-bryophytes-61776435 (Bryophytes)
6. https://www.slideshare.net/sumitachoudhary/marchantia-ppt (*Marchantia*)
7. https://www.slideshare.net/SyedaFari2/anthoceros-133566351(*Anthoceros*)
8. https://www.slideshare.net/AnkitaThakur52/funaria-80239528 (*Funaria*)

Pedagogy

Chalk & Talk, Group Discussion, PPT

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Content and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
	ALGAE			
Unit - I				
1.1	Plant Kingdom	2	Discussion	Green Board
1.2	General characters of Algae	2	Lecture	Green Board
1.3	Fritsch classification of Algae (Outline only)	3	Lecture	Green Board
1.4	Characters of Algae at class level		Discussion	Green Board
1.4	Economic importance of Algae	2	Discussion	Green Board
1.5	Importance of Algae in Agriculture, Environment, Medicine and Industries	3	Discussion	Green Board
Unit - II				
2.1	Structure of *Oedogonium*	2	Lecture	Green Board
2.2	Reproduction of *Oedogonium*	2	Chalk & Talk	Green Board
2.3	Structure of *Vaucheria*	2	Chalk & Talk	Green Board
2.4	Reproduction of *Vaucheria*	2	Chalk & Talk	Green Board
2.5	Structure of *Diatoms*	2	Chalk & Talk	Green Board
2.6	Reproduction of *Diatoms*	2	Chalk & Talk	Green Board
Unit – III				
3.1	Structure of *Sargassum*	2	Chalk & Talk	Green Board
3.2	Reproduction of *Sargassum*	2	Discussion	Green Board
3.3	Structure of *Polysiphonia*	2	PPT	LCD
3.4	Reproduction of *Polysiphonia*	2	Chalk & Talk	Green Board
3.5	Structure of *Nostoc*	2	Chalk & Talk	Green Board
3.6	Reproduction of *Nostoc*	2	Chalk & Talk	Green Board
	BRYOPHYTES			
Unit – VI				

4.1	General characters	4	Discussion	Green Board
4.2	Classification of Bryophytes (G.M. Smith, 1955)	4	Chalk & Talk	Green Board
4.3	Economic importance	4	Chalk & Talk	Green Board
Unit – V				
5.1	Structure of *Marchantia*	2	Lecture	Green Board
5.2	Reproduction of *Marchantia*	2	Chalk & Talk	Green Board
5.3	Structure of *Anthoceros*	2	Chalk & Talk	Green Board
5.4	Reproduction of *Anthoceros*	2	Chalk & Talk	Green Board
5.5	Structure of *Funaria*	2	Chalk & Talk	Green Board
5.6	Reproduction of *Funaria*	2	Discussion	Green Board
	Total	**60**		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. C. SOUNDAR RAJU	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Theory		SEMESTER – I
Course Title: Fungi and Plant Pathology		
Course Code: 08CT12	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire the basic knowledge about primitive plants kingdom
- To understand the symptomology of diseases there by gaining knowledge on prevention of diseases
- To recognize the beneficial and harmful fungi for human life

Course Outcomes (CO)

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (according to Bloom's Taxonomy)**
CO 1	To understand the salient features of Fungi and its economic importance	K1, K2 & K3

CO2	To acquire the knowledge of morphology and life history of fungi	K1, K2 & K3
CO3	To gain the knowledge of morphology and life history of fungi	K1, K2 & K3
CO 4	To distinguish the lichens and its economic importance	K1, K2 & K3
CO 5	To indentify the plant diseases and its controlling measures	K1, K2 & K3

K1-Knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT No.	CONTENT	HOURS
	FUNGI	
UNIT I	Introduction – General characteristics of Fungi - Classification of Fungi based on Alexopoulos and Mims (1979) – Economic importance of Fungi – Beneficial aspects (Industries, Pharmaceuticals, Agriculture, Genetical Studies) – Harmfulness (Plant diseases, Human Diseases, Food Spoilages)	**12**
UNIT II	Structure and reproduction of the following: a. Myxomycetes : *Stemonitis* b. Oomycetes : *Albugo* c. Ascomycetes : *Penicillium*	**12**
UNIT III	Structure and Reproduction of the following: a. Basidiomycetes : *Puccinia* and *Agaricus* b. Deuteromycetes : *Cercospora*	**12**
UNIT IV	Lichens: A general account of lichens – Structure (internal and external morphology), classification (Crustose, Foliose, Fruticose, Leprose, Squamulose & Wolf Lichens), reproduction and economic importance of lichens.	**12**
	PLANT PATHOLOGY	
UNIT V	Symptoms, causes and control measures of the following diseases a. Viral disease : Bunchy top of Banana b. Bacterial disease : Citrus Canker C. Fungal disease : Blast disease in Rice d. Phtoplasma : Little leaf of Brinjal	**12**

Mapping of CLO with PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO 1	**9**	**9**	**9**	**9**	**3**	**6**	**9**
CLO 2	**9**	**9**	**3**	**1**	**9**	**3**	**1**
CLO 3	**9**	**9**	**9**	**3**	**1**	**3**	**1**
CLO 4	**9**	**9**	**3**	**1**	**9**	**3**	**1**
CLO 5	**9**	**9**	**9**	**3**	**1**	**3**	**9**

9-Strong; **3-Medium;** **1-Low**

CLO-PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	**9**	**3**	**9**	**9**	**9**
CLO2	**9**	**3**	**9**	**9**	**9**
CLO3	**9**	**9**	**3**	**3**	**9**
CLO4	**9**	**9**	**3**	**9**	**3**
CLO5	**9**	**3**	**9**	**3**	**9**

9-Strong; 3-Medium; 1-Low

Text Books

1. Fungi - B.R. Vashista, S.Chand & Company Ltd, Delhi, 2014 Ed.
2. Botany for Degree Students Fungi - P.C. Vashishta, S.Chand & Company Ltd, Delhi, 2018 Ed.
3. Plant pathology - B.P. Pandey, Chand & Company Ltd, Delhi, 2014 Ed.

Reference Books

1. Introduction to Mycology - C.J.Alexopoulos, Willey Eastern Pvt. Ltd, 2013 Ed.
2. Fungi and allied MicrLOCFs – O.P. Sharma, Mcgraw Hill, New Delhi, 2016 Ed.
3. The Fungi – Satish Kumar, Pragati Prakashan, Meerut 2015 Ed

Online Resources:

1. https://www.slideshare.net/RAMESHVELCHAMY/introduction-to-fungi-new (Introduction to Fungi)
2. https://www.slideshare.net/RAMESHVELCHAMY/classificatio-of-fungi-alexopoulos-and-mims-new (Classification of Fungi)
3. https://www.slideshare.net/RAMESHVELCHAMY/economic-importance-of-fungi-238546961 (Economic Importance of Fungi)
4. https://www.slideshare.net/RAMESHVELCHAMY/penicillium-structure-and-reproduction (Penicillium-Structure and Reproduction)
5. https://www.slideshare.net/RAMESHVELCHAMY/agaricus-238960757 (Agaricus - Structure and Reproduction)
6. https://www.slideshare.net/RAMESHVELCHAMY/lichens-sturcture-classification-and-reproduction (Lichens – Types, Structure, Reproduction and Importances)
7. https://www.slideshare.net/RAMESHVELCHAMY/little-leaf-of-brinjal-238960763 (Little Leaf of Brinjal)
8. https://www.slideshare.net/RAMESHVELCHAMY/blast-disease-in-rice (Blast disease in Rice)
9. https://www.slideshare.net/RAMESHVELCHAMY/citrus-canker-239051433 (Citrus Canker)
10. https://www.slideshare.net/RAMESHVELCHAMY/bunchy-top-of-banana (Bunchy Top of Banana)

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
	FUNGI			
	UNIT I			
	Classification of Fungi based on Alexopoulos and Mims	3	Discussion	
	Economic importance of Fungi	3	PPT	LCD
	Beneficial aspects (Industries, Pharmaceuticals, Agriculture, Genetical Studies)	3	Discussion	
	Harmfulness (Plant diseases, Human Diseases, Food Spoilages)	3	Discussion	
	UNIT II			
	Structure and reproduction of Myxomycetes : *Stemonites*	4	Chalk & Talk	Green Board
	Structure and reproduction of Oomycetes : *Albugo*	4	Chalk & Talk	Green Board
	Structure and reproduction of Ascomycetes : *Penicillium*	4	Chalk & Talk	Green Board
	UNIT III			
	Structure and reproduction of Basidiomycetes : *Puccinia*	4	Chalk & Talk	Green Board
	Structure and reproduction Basidiomycetes : *Agaricus*	4	Chalk & Talk	Green Board
	Structure and reproduction of Deuteromycetes : *Cercospora*	4	Chalk & Talk	Green Board
	UNIT IV			
	General Characteristics of Lichens	2	Lecture	
	Structure of Lichens – Crustose, Foliose & Fruticose, Leprose, Squamulose & Wolf Lichens	4	Chalk & Talk	Green Board
	Reproduction of Lichens	4	Chalk & Talk	Green Board
	Economic importance of Lichens	2		
	PLANT PATHOLOGY			
	UNIT V			
	Symptoms, causes and control of Viral disease - Bunchy top of Banana	3	Chalk & Talk	Green Board
	Symptoms, causes and control of Bacterial disease - Citrus Canker	3	Chalk & Talk	Green Board
	Symptoms, causes and control of Fungal disease - Blast disease in Rice	3	Chalk & Talk	Green Board
	Symptoms, causes and control of Mycoplasma - Little leaf of Brinjal	3	Chalk & Talk	Green Board
	Total	**60**		

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. C. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

(For those students admitted during the 2022- 2023 and after)

PART – IV : Generic Elective Course	SEMESTER - I
Course Title: Energy Resources	

Course Code: **08NE11**	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To kindle the students to know the core value of natural resources
- To study various types of conventional and non-conventional energy resources including solid, liquid and gaseous fuels.
- To commemorate the diminish of natural resources

Syllabus

UNIT No	CONTENT	HOURS
Unit – I	Sources of energy – conventional and non conventional-Present world Energy scenario.	**6**
Unit – II	Conventional energy- coal, oil, gas, thermal power and nuclear energy	**6**
Unit – III	Non-Conventional - Solar energy-advantages-solar gadgets available Solar energy utilization in India and Hydro power.	**6**
Unit – IV	Wind energy – advantages and disadvantages -wind mills and Tidal energy.	**6**
Unit – V	Biomass energy – Biogas production, bioethanol, biodiesel (from plant lipids and from hydrocarbons)	**6**

Text Books:

1. Environmental science engineering – Dr. A. Ravikrishanan Sri Krishna Hitect Pub Company Pvt. Ltd. Chennai, 2012 Ed.
2. Environmental science engineering - C.P. Venugobal Rao, PHI Learning New Delhi, 2010 Ed.
3. Environmental science engineering - Anuradha Publishers Chennai, 2010 Ed.

Reference Books:

1. Renewable energy technologies for rural sector - Shyam, M, Pandey, K.C & A.K. Dubey, 2013 Ed.
2. Environmental studies – SK.Grarg, Khanna Pub Delhi, 2012 Ed.
3. Environmental Geography – Alka Gautam, Sharada pustac bharan, Alakabad, 2010 Ed.

Online Resources:

1. https://www.nrdc.org/stories/renewable-energy-clean-facts (Renewable Energy)
2. https://www.greenfacts.org/en/biofuels/l-2/1-definition.htm (Biofuels)
3. https://www.solarschools.net/knowledge-bank/non-renewable-energy (Conventional energy)
4. https://www.nrdc.org/stories/renewable-energy-clean-facts (Energy resources)
5. https://www.slideshare.net/Rameshpandey41/energy-resources-71750497 (Conventional and Non conventional Energy)
6. https://www.slideshare.net/manowarachowdhury3/ppt-on-energy-resources (Conventional energy resources)
7. https://www.slideshare.net/SushilKumarGupta4/wind-energy-77305212 (Wind energy)
8. https://www.slideshare.net/asadleo002/biogas-production-23836894 (Biogas production)

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 - 23 and after)

PART – III : Core Course Theory		SEMESTER - II
Course Title: Pteridophytes, Gymnosperms & Paleobotany		
Course Code: 08CT21	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire the knowledge about primitive terrestrial plants
- To understand the structure and reproduction of Pteridophytes and Gymnosperms
- To develop skills in fossil plants

Course Outcomes (CO)

On the successful completion of the course, students will be able

CO Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO1	To learn and identify the general characters of Pteridophytes	K1, K2 & K3
CO2	To remember the structural organization and reproduction of Pteridophytes	K1, K2 & K3
CO3	To understand the characteristic features of gymnosperms and its importance	K1, K2 & K3
CO4	To interpret the structural organization and developmental stages of Gymnosperms	K1, K2 & K3
CO5	To aware the fossil types and its formation	K1, K2 & K3

K1-knowledge **K2**-Understand **K3**-Apply

Syllabus

UNIT NO	CONTENT	HOURS
	Pteridophytes	
Unit- I	General characteristics of Pteridophytes - Classification of Pteridophytes (Sporne 1966) – Types of Stele - Stelar evolution – Economic importance of Pteridophytes	**12**
Unit- II	Structure and reproduction of the following a. Psilotales - *Psilotum* b. Lycopodiales - *Lycopodium* c. Equisetales - *Equisetum* d. Marsileales – *Marselia*	**12**
	Gymnosperms	
Unit- III	General characteristics of gymnosperms - Classification of Gymnosperms (Sporne, 1965) - Economic importance of gymnosperms with reference to wood, essential oils, resins and drugs	**12**
Unit-IV	Structure and Reproduction of the following a. Cycadales - *Cycas* b. Coniferales - *Pinus* c. Gnetales- *Gnetum*	**12**
	Paleobotany	

Unit- V	Geological era - Formation of fossils – types of fossils - detailed study of the following a. Psilophytales- *Rhynia* b. Equisetales- *Calamites* c. Cycadofilicales – *Lyginopteris*	**12**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	9	9	3	3	3	9	3
CLO 2	9	9	3	3	9	9	3
CLO 3	9	9	3	3	9	9	3
CLO 4	9	1	3	3	3	9	3
CLO 5	9	3	3	3	1	9	3

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CLO 1	9	9	3	3	3
CLO 2	9	9	3	9	9
CLO 3	9	9	9	9	9
CLO 4	9	9	9	9	3
CLO 5	9	9	3	3	3

9-Strong **3**-Medium **1**-Low

Text Books:

1. An introduction to Embryophyta –Pteridophytes - N.S. Parihar, Surjeet Publications, Delhi, 2012 Ed.
2. Pteridophyta - PC Vashishta, AK Sinha, Anil Kumar, S Chand and Company PVT Ltd, New Delhi, 2016 Ed.
3. Botany for Degree Students Gymnosperms - P.C. Vashishta, S.Chand& Company Ltd, Delhi, 2014 Ed.

Reference Books:

1. Morphology of Gymnosperms - Coulter, M. Jhon, Surjeet Publications, Delhi, 2014 Ed.
2. College Botany – Ganfule Hirendra (Chandra) Vol. I, New centre book agency, London, 2013 Ed.
3. Gymnosperms - OP Sharma, Shivani Dixit, Pragati Prakashan, PVT Ltd, Meerut, 2020

Online Resources:

1. https://www.slideshare.net/EasyBiologyClassEBC/pteridophytes-general-characteristics-ppt-by-easybiologyclass (Pteridophytes)
2. https://www.slideshare.net/SyedaFari2/psilotum-88047646 (*Psilotum*)
3. https://www.slideshare.net/ArSlanJanjua6/marsilea-structure-and-reproduction (*Marsilea*)
4. https://www.slideshare.net/SARASilpi/gymnosperms-10047007 (Gymnosperms)
5. https://www.slideshare.net/SyedaFari2/cycas (*Cycas*)
6. https://www.slideshare.net/shivduraigaran/gnetum-a-powerpoint-presentation-on-gymnospems (*Gnetum*)
7. https://www.slideshare.net/pradhanpravin11/paleobotany (Paleobotany)
8. https://www.slideshare.net/HemanthKumar1131/types-of-fossils-and-uses (Fossils)
9. https://www.slideshare.net/MaitriThakor/rhynia (*Rhynia*)

Pedagogy

Chalk & Talk, Group Discussion, PPT

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Content and Lecture Schedule

Assessment

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
Pteridophytes				
Unit –I				
1.1	General characters of Pteridophytes	2	Discussion	Green Board
1.2	Classification of Pteridophytes (Sporne 1976)	4	Lecture	Green Board
1.3	Stelar evolution	4	Discuss	Green Board
1.4	Economic importance of Pteridophytes	2	Lecture	Green Board
Unit – II				
2.1	Structure of *Psilotum*	1	Lecture	Green Board
2.2	Reproduction of *Psilotum*	2	Chalk & Talk	Green Board
2.3	Structure of *Lycopodium*	1	Chalk & Talk	Green Board
2.4	Reproduction of *Lycopodium*	2	Chalk & Talk	Green Board
2.5	Structure of *Equisetum*	1	Chalk & Talk	Green Board
2.6	Reproduction of *Equisetum*	2	Chalk & Talk	Green Board
2.7	Structure of *Marselia*	1	Chalk & Talk	Green Board
2.8	Reproduction of *Marselia*	2	Chalk & Talk	Green Board
Gymnosperms				
Unit –III				
3.1	General characters of Gymnosperms	2	Chalk & Talk	Green Board
3.2	Classification of Gymnosperms (Sporne, 1967)	5	Discussion	
3.3	Economic importance of gymnosperms with reference to wood, essential oils, resins and drugs	5	Chalk & Talk	Green Board

Unit – IV				
4.1	Structure of *Cycas*	2	Discussion	Green Board
4.2	Reproduction of *Cycas*	2	Chalk & Talk	Green Board
4.3	Structure of *Pinus*	2	Chalk & Talk	Green Board
4.4	Reproduction of *Pinus*	2	Chalk & Talk	Green Board
4.5	Structure of *Gnetum*	2	Lecture	Green Board
4.6	Reproduction of *Gnetum*	2		
Paleobotany				
Unit –V				
5.1	Geological era	2	Lecture	Green Board
5.2	Formation of fossils	2	Chalk & Talk	Green Board
5.3	types of fossils	2	Chalk & Talk	Green Board
5.4	Structure of Rhynia	2	Chalk & Talk	Green Board
5.5	Structure of Calamites	2	Chalk & Talk	Green Board
5.6	Structure of Lyginopteris	2	Chalk & Talk	Green Board
	Total	**60**		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. C. SOUNDAR RAJU	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Theory		SEMESTER - II
Course Title: Plant Anatomy and Microtechniques		
Course Code: 08CT22	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To understand the knowledge about basic internal morphology of higher plants
- To familiarize the arrangement of cells, tissues within ground and vascular tissue system in vascular plants.
- To train the students in handling microscopes for taking sections

Course Outcome

On the successful completion of the course, students will be able to

CO Number	**Course Outcome**	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	To knowledge of unique nature of plant cell wall and classify plant tissues	K1, K2 & K3
CO2	To compare anatomical features of dicot and monocot stem and root	K1, K2 & K3
CO3	To understand the unique nature of secondary thickening and anomalous secondary growth	K1, K2 & K3
CO4	To gain the knowledge of internal anatomy of dicot leaf, node and lateral root formation	K1, K2 & K3
CO5	To apply the skills to prepare of microscopic slides	K1, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT NO	**CONTENT**	**HOURS**
Unit – I	Cell wall – Chemical nature of cell wall – Ultra structure of cell wall – Plasmodesmata and pits – Tissue system: Meristems, Simple tissues, Complex tissues, Secretary Tissues & Trichomes	**12**

Unit – II	Primary structures of dicot stem, monocot stem, Dicot root & Monocot root	**12**
Unit – III	Normal secondary thickening in dicot stem and dicot root – Anomalous secondary growth in *Boerhaavia* and *Dracaena*	**12**
Unit – IV	Internal structure of Dicot leaf – Nodal anatomy of *Justicia*, *Azadirachta* and *Aralia* – Lateral roots formation	**12**
Unit – V	Microtechniques: Fixation of plant materials – Sectioning of plant materials (Hand section only) – Staining – Mounting and whole mount preparation	**12**

Mapping of CO with PO

Mapping of CLO with PLO

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**
CLO1	**9**	**9**	**9**	**3**	**1**	**3**	**3**
CLO2	**9**	**9**	**3**	**9**	**3**	**1**	**3**
CLO3	**9**	**9**	**9**	**3**	**9**	**3**	**3**
CLO4	**9**	**3**	**9**	**1**	**3**	**3**	**3**
CLO5	**9**	**9**	**9**	**3**	**1**	**1**	**1**

9-Strong 3-Medium **1**-Low

CLO-PSO Mapping

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CLO1	**9**	**3**	**9**	**9**	**9**
CLO2	**9**	**3**	**9**	**9**	**9**
CLO3	**9**	**9**	**1**	**3**	**9**
CLO4	**9**	**9**		**9**	**3**
CLO5	**9**	**3**	**9**	**3**	**9**

9-Strong 3-Medium **1**-Low

Text Books:

1. Plant Anatomy - P.C.Vashista, S.Chand & Company Ltd, Delhi, 2012 Ed.
2. Plant Anatomy - Kaatherine, Esau, Wiley Eastern Pvt. Ltd, 2013 Ed.
3. Plant Anatomy and Microtechniques, Annie Ragland, Saras Publications, Nagercoil, 2014 Ed.
4. Botany for Degree Students, BP Pandey, S Chand and Company PVT Ltd. 2012 Ed.

Reference books

1. Introduction to Plant anatomy - Eames & Mac Daniels, Tata McGraw Hill Education in India, 2010 Ed.
2. Plant Anatomy - M.S.Tayal, Rastogi Publications, Meerut, 2010 Ed.
3. Plant Anatomy - A.Fahn, Pergamon Press, 2010 Ed.

Online Resources:

1. https://www.researchgate.net/publication/228552007 (A beginner's guide to the study of plant structure)

2. https://www.researchgate.net/publication/309118583 (Techniques in Anatomy Cytology and Histochemistry of Plants)
3. https://www.freebookcentre.net/biology-books-download (Plant Anatomy Lecture)
4. https://www.researchgate.net/publication/318394791 (Plant Anatomy and Embryology)
5. https://www.easybiologyclass.com/ (Parenchyma cells in plant structure classification and functions
6. https://pdfbookslibs.com/esaus (Plant Anatomy meristems cells)

Pedagogy

Chalk & Talk, PPT, Experiment

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, Permanent Slide, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
Unit I: Cell wall and Tissue system				
1.1	Ultra Structure of cell wall	2	Calk & Talk	Green Board
1.2	Chemical nature of cell wall	1	Calk & Talk	Green Board
1.3	Plasmodesmata	1	Calk & Talk	Chart
1.4	Pits	1	Calk & Talk	Green Board
1.5	Meristems	2	Calk & Talk	Chart & Green Board
1.6	Simple tissue	1	Calk & Talk	Green Board
1.7	Complex tissues	2	Calk & Talk	Chart & Green Board
1.8	Secretary Tissues	1	Calk & Talk	Chart & Green Board
1.9	Trichomes	1		
Unit – II: Primary structure of plant organs				
2.1	Internal structure of Dicot stem	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.2	Internal structure of Monocot stem	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.3	Internal structure of Dicot root	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.4	Internal structure of Monocot root	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
Unit – III: Normal and Anomalous secondary growth				
3.1	Normal secondary thickening in dicot stem	3	Calk & Talk	Chart, Plant material & Green Board
3.2	Normal secondary thickening in dicot root	3	Calk & Talk	Chart, Plant material & Green Board
3.3	Anomalous secondary growth in *Boerhaavia*	3	Calk & Talk	Chart, Plant material & Green Board
3.4	Anomalous secondary growth in *Dracaena*	3	Calk & Talk	Chart, Plant material & Green Board
Unit – IV: Nodal Anatomy				

4.1	Internal structure of Dicot leaf	3	Calk & Talk	Chart, Plant material & Green Board
4.2	Nodal anatomy in *Justicia*	2	Calk & Talk	Green Board
4.3	Nodal anatomy in *Azadirachta*	2	Calk & Talk	Green Board
4.4	Nodal anatomy in *Aralia*	2		
4.5	Lateral roots formation	3	Calk & Talk	Green Board
Unit – V: Microtechniques				
5.1	Introduction of Microtechniques	2	Calk & Talk	Green Board
5.2	Microtomes	2	Calk & Talk	Green Board
5.3	Fixation of plant materials	2	Calk & Talk	Green Board & Specimen
5.4	Sectioning (Hand section)	2	Calk & Talk	Green Board & Plant material
5.5	Staining	2	Calk & Talk	Green Board
5.6	Mounting	2	Calk & Talk	Green Board
Total		60		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. V. RAMESH	**Dr. N. LAXMANAN**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Lab		SEMESTER - II
Course Title: Algae, Bryophytes, Fungi, Plant Pathology, Pteriodophytes, Gymnosperms, Paleobotany and Plant Anatomy		
Course Code: 08CT23	Hours per week:2	Credit:4
CIA Marks: 40	ESE Marks: 60	Total Marks: 100

Preamble

- To understand the plant diversity, thallus construction of selected forms
- To get hands on knowledge on microbial culture and plant pathology techniques
- To learn about the internal structure of vascular plants, fossilized plant forms and Plant evolution.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO	Course Outcome	Knowledge Level

Number		(According to Bloom's Taxonomy)
CO1	To revise the morphology and reproductive structures in Algae, Fungi, Lichens, and Bryophyte	K1, K2 & K3
CO2	To familiarize the internal structures, spore bearing parts of selected plant forms and fossils	K1, K2 & K3
CO3	To compare the life cycles of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms	K, K2 & K3
CO4	To prepare micro sections and to professionally draw plant sketches	K1, K2 & K3
CO5	To analyze bacterial, fungal, viral and mycoplasma plant diseases	K1, K2 & K3

K2 – Understand **K3** – Apply K4 - Analyze

Syllabus

UNIT NO	CONTENT	HOURS
Unit – I	A detailed study of thallus organization and reproductive structures of the following forms: **Algae:** *Oedogonium, Vaucheria,* Diatoms, *Sargassum, Polysiphonia, Nostoc* Field trip for algae collection and submission of reports **Fungi :** *Penicillium, Albugo, Puccinia, Agaricus* and *Cercospora* **Lichen –***Usnea, Parmelia*	**12**
Unit – II	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: ***Bryophytes:*** *Marchantia , Anthoceros, Funaria*	**12**
Unit – III	Study of following diseases: Bunchy top of Banana, Citrus Canker, Blast disease in Rice and Little leaf of Brinjal Plant Pathology: submission of herbarium of infected plant specimens	**12**
Unit – IV	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: **Pteridophytes***: Psilotum, Lycopodium & Marselia* **Gymnosperms** *: Cycas & Gnetum* **Fossils** *: Rhynia, Calamites & Lyginopteris*	**12**
Unit – V	A detailed study of the internal morphology of dicot, monocot stem & root and dicot leaf – including anomalous secondary thickening.	**12**

Mapping of CLO with PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	**9**	**9**	**9**	**3**	**9**	**3**	**3**
CLO2	**9**	**9**	**3**	**9**	**3**	**9**	**9**
CLO3	**9**	**9**	**9**	**3**	**9**	**3**	**9**
CLO4	**9**	**3**	**9**	**3**	**3**	**3**	**3**
CLO5	**9**	**9**	**9**	**3**	**3**	**3**	**3**

9-Strong 3-Medium **1**-Low

CLO-PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	**9**	**3**	**9**	**9**	**9**
CLO2	**9**	**3**	**9**	**9**	**9**
CLO3	**9**	**9**	**3**	**3**	**9**
CLO4	**9**	**9**	**9**	**9**	**3**
CLO5	**9**	**3**	**9**	**3**	**9**

9-Strong; 3-Medium; 1-Low

Text Books:

1. Plant anatomy - P.C.Vashista, S.Chand & Company Ltd, Delhi, 2012 Ed.
2. Text Book of Botany – V. Singh, Rastogi Publications, Meerut, 2013 Ed.
3. Botany for degree students algae – P.C.Vashishta, S.Chand& Comp. Ltd, Delhi, 2014 Ed.

Reference books

1. Introduction to Plant anatomy - Eames & Mac Daniels, Tata McGraw Hill Education in India, 2010 Ed.
2. College Botany – GanfuleHirendra (Chandra) Vol. I, New centre book agency, London, 2013 Ed.
3. The structure and reproduction of Algae Vol. I & II - F.E.Fritsch, Cambridge University Press.

Online Resources

1. **http://virtualplant.ru.ac.za/Main/ANATOMY/B1PR2006.htm#principle (Plant Antomy)**
2. **https://ucmp.berkeley.edu/IB181/HpageIB181.html (Virtual Paleo Botany Lab)**

Pedagogy

Chalk & Talk, Experiment

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, Permanent Slide, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
	UNIT I			
1.1	*Oedogonium, Vaucheria, Diatoms, Sargassum*	2	Calk & Talk	Green Board, Plant material , Specimen & permanent slide
1.2	*Polysiphonia, Nostoc*	1	Calk & Talk	Green Board, Plant material , Specimen & permanent slide
1.3	*Penicillium, Albugo, Puccinia,*	1	Calk & Talk	Green Board, Plant material , Specimen & permanent slide
1.4	*Agaricus* and *Cercospora*	1	Calk & Talk	Green Board, Plant

				material , Specimen & permanent slide
1.5	*Usnea, Parmelia*	1	Calk & Talk	Green Board, Plant material , Specimen & permanent slide
Unit – II				
2.1	*Marchantia, Anthoceros,*	3	Calk & Talk	Chart, Green Board, Plant material , Specimen & permanent slide
2.2	*Funaria*	3	Calk & Talk	Chart, Green Board, Plant material , Specimen & permanent slide
Unit – III				
3.1	Bunchy top of Banana, Citrus Canker,	3	Calk & Talk	Plant material
3.2	Blast disease in Rice and Little leaf of Brinjal	3	Calk & Talk	Plant material
Unit – IV				
4.1	*Psilotum, Lycopodium & Marselia*	2	Calk & Talk	Plant material & Green Board
4.2	*Cyca & Gnetum*	3	Calk & Talk	Plant material
4.3	*Rhynia, Calamites & Lyginopteris*	3	Calk & Talk	Plant material
Unit – V				
5.1	Primary structures of dicot & mono stem and dicot leaf	2	Calk & Talk	Chart & Plant material Green Board
5.2	Primary structures of dicot & monocot root	2	Calk & Talk	Chart & Plant material Green Board
5.3	Anomalous secondary growth in *Boerhaavia & Dracaena*	2	Calk & Talk	Chart & Plant material Green Board
Total		30		

Course Designer **Head of the Department**

(Name of the Course Teacher)

Dr. C. SOUNDAR RAJU **Dr. V. RAMESH**

DEPARTMENT OF BOTANY

(For those students admitted during the 2022- 2023 and after)

PART – IV : Generic Elective Course		SEMESTER - II
Course Title: Gardening		
Course Code: **08NE21**	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Objectives:

- To acquire the basic knowledge about the improvement of hybrids of plant
- To know the various types of ecofriendly environment in front of homes
- To know the simple practice for the improvement of innovative garden

Syllabus

UNIT NO	CONTENT	HOURS
Unit – I	Introduction to gardening – types of garden - Advantages of gardening	**6**
Unit – II	Propagation methods like cutting, layering, Grafting, budding, division and separation	**6**
Unit – III	Garden operations: Transplanting methods (Bare rooted, shifting and balling and burlapping) - irrigation (surface, spray and drip) – Manuring	**6**
Unit – IV	Ornamental gardening, Indoor gardening, Rockery, Bonsai and Lawn making, Terrarium, Aquarium, Terrace garden, Veranda garden and Hanging baskets	**6**
Unit – V	Kitchen gardening – importance, layout, suitable plants and advantages	**6**

Text Books:

1. Plant Breeding – SS. Sandhu, Black Prints, New Delhi, 2013 Ed.
2. A Guide to Horticulture - J.S. Sundararaj, Kalyani Pub, Chennai, 2012 Ed.
3. Horticulture – V.L. Sheela, MJ Publishers, 2013 Ed.

Reference Books:

1. A manual of Gardening – Arun zingare, Satyam Pub, Jaipur, 2013 Ed.
2. Horticulture at a glance – Amar Singh, Kalyani Publishers, Chennai, 2013 Ed.
3. Dry Land Horticulture in India – P.P. Deshmukh, Himalaya Publishing House, Mumbai, 2013 Ed.

Online Resources

1. **https://gardenbeast.com/ebooks/ (Garden)**
2. **https://www.gardenfundamentals.com/free-gardening-books/ (Components of Gardens)**
3. **https://www.barnesandnoble.com/b/free-ebooks/nook-books/home-garden/gardening/_/N-ry0Z8qaZ12zj (Gardening)**
4. **https://manybooks.net/titles/rockwelletext048hmvg10.html (Rockery)**
5. **http://index-of.co.uk/Tutorials/Gardening%20Basics%20for%20Dummies.pdf**
6. **http://www.eagleheightsgardens.org/tips/garden_manual_v_1.1.pdf**

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 -23 and after)

PART – III : Core Course Theory		SEMESTER - III
Course Title: **Biochemistry, Biophysics and Biometrics**		
Course Code: 08CT31	Hours per week:4	Credit:4

CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To learn the structure, classification and properties of macro molecules
- To understand the principles of energy production of biological systems
- To train the students in basic statistical methods used in interpreting scientific data

Course Outcomes (CO)

On the successful completion of the course, students will be able

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO 1	To understand the structure and functions of carbohydrates and lipids in living organisms	K1, K2 & K3
CO2	To learn the structure and role of proteins, amino acids and enzymes	K1, K2 & K3
CO3	To remember chemical nature and structure of nucleic acids	K1, K2 & K3
CO 4	To apply the fundamentals of thermodynamics and biophysical forces in biochemical systems	K1, K2 & K3
CO 5	To acquire the knowledge and applications of fundamentals in Biostatistics	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT No.	CONTENT	HOURS
	Biochemistry	
UNIT I	Carbohydrates: classification, structure (open chain structure, ring structure of glucose) properties of monosaccharides only and Functions of carbohydrates - Lipids: Triglycerides, fatty acids: saturated and unsaturated, classification of lipids: simple, compound and derived lipids (brief account only)	**12**
UNIT II	Amino acids: types and properties only- Proteins: primary, secondary, tertiary structure and physiochemical properties – Enzymes: Classification, nomenclature, properties and Mechanism of enzyme action: Lock and Key model and Induced Fit model	**12**
UNIT III	Nucleic acids: introduction, definition & types: Nucleotides – building blocks of Nucleic acids, double helix model of DNA – significance of DNA, polymorphism of DNA Helix, DNA replication, Transcription & Translation - RNA and its types – structure of tRNA – Mitochondrial DNA & Chloroplast DNA	**12**
	Biophysics	

UNIT IV	Introduction - Nature of light, light and plant pigments – absorption of light – Action spectra – Physical phenomena: Bioluminescence, Fluorescence, Phosphorescence - Law of thermodynamics – Redox Potential – chloroplast bioenergetics.	**12**
Biometrics		
UNIT V	Introduction- Basic concepts of biostatistics - Collection, Presentation of data: Tabulation, Graphic and Diagrammatic - Measures of central tendencies: Mean, Median, Mode - Measures of dispersion - Standard deviation and standard error	**12**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	9	3	9	9	9	9	9
CLO 2	9	3	9	9	9	9	9
CLO 3	9	3	9	9	9	3	3
CLO 4	9	3	1	19	3	9	3
CLO 5	9	3	9	9	9	1	9

Mapping of CLO with PSO

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CLO 1	9	1	9	9	9
CLO 2	3	1	9	9	9
CLO 3	9	1	1	3	3
CLO 4	3	1	1	3	9
CLO 5	1	1	3	9	9

9-Strong; 3-Medium; 1-Low

Text Books

1. Satyanarayana, U. 2005. Biochemistry. Books and Allied (P) Ltd. Calcutta.
2. Essentials of Biophysics – P.Narayanan, New Age Int. Pub. New Delhi.
3. Biostatistics – Gurumani, MJP Publications, Chennai

Reference Books

1. Outlines of Biochemistry - Conn & Stomp, John Wiley & Sons, 2010 Ed.

2. Biochemistry – Voet & Voet. John Wiley & Sons, 2011 Ed.
3. Biochemistry – Jeremy M.Berg et al., WH. Freeman and Company, 2015 Ed.

Online Resources

1. https://onlinecourses.swayam2.ac.in/cec20_bt12/announcements?force=true (Biochemistry of Biomolecules)
2. https://onlinecourses.swayam2.ac.in/cec19_bt02/announcements?force=true (Biochemistry and Molecular Biology)
3. https://www.slideshare.net/RAMESHVELCHAMY/carbohydrates-238355692 (Carbohydrates Introduction)
4. https://www.slideshare.net/RAMESHVELCHAMY/carbohydrates-monosaccharides-properties (Carbohydrates: Properties Of Monosaccharides)
5. https://www.youtube.com/watch?v=8D6qL9W9MyE (Structure of Monosaccharides)
6. https://www.slideshare.net/RAMESHVELCHAMY/sturcture-of-dna (Structure and Types of DNA)
7. https://www.slideshare.net/RAMESHVELCHAMY/structure-and-types-of-rna (Structure and Types of RNA)
8. https://www.slideshare.net/RAMESHVELCHAMY/aminoacids-238546959 (Amino Acids)
9. https://www.slideshare.net/RAMESHVELCHAMY/enzymes-238569149 (Enzymes)
10. https://www.slideshare.net/RAMESHVELCHAMY/proteins-238569158 (Proteins)
11. **https://www.slideshare.net/RAMESHVELCHAMY/law-of-thermodynamics-bioluminescence-fluorescence-phosphorescence (Biophysics)**
12. **https://www.slideshare.net/RAMESHVELCHAMY/basics-of-bio-statistics (Biostatistics)**
13. https://www.slideshare.net/RAMESHVELCHAMY/biostatistics-238960760 **(Biostatistics)**

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
Biochemistry				
UNIT I				
1.1	Carbohydrate: Classification,	3	Discussion	
1.2	Structure of Monosaccharide	2	Chalk & Talk	Green Board
1.3	Properties of Monosaccharide	3	Chalk & Talk	Green Board
1.4	Lipids – Types	2	PPT	LCD
1.5	Properties lipids	2	PPT	LCD
UNIT II				

2.1	Proteins: Structure	2	Chalk & Talk	Green Board
2.2	Functions of Proteins	2	PPT	LCD
2.3	Amino acids: Types	3	Chalk & Talk	Green Board
2.4	Properties amino acids	2	PPT	LCD
2.5	Enzymes: Classification	2	Chalk & Talk	Green Board
2.6	Properties of enzymes	2	Chalk & Talk	Green Board
2.7	Enzyme action.	3	PPT	LCD
UNIT III				
3.1	Nucleic acids: introduction	1	Chalk & Talk	Green Board
3.2	Types: DNA and RNA	1	Chalk & Talk	Green Board
3.3	Nucleotides – building blocks of DNA and RNA	2	Chalk & Talk	Green Board
3.4	Double helix model of DNA	2	PPT	Green Board
3.5	significance of DNA, polymorphism of DNA Helix	1	PPT	Green Board
3.6	DNA replication, Transcription & Translation	3	PPT	Green Board
3.7	Types of RNA – structure of tRNA.	2	PPT	Green Board
UNIT IV				
4.1	Nature of light	1	Lecture	
4.2	Light and plant pigments	2	PPT	LCD
4.3	Absorption of light – fate of exited electrons	2	Chalk & Talk	Green Board
4.4	Action spectra	2	Chalk & Talk	Green Board
4.5	Physical phenomena Bioluminescence, Fluorescence, Phosphorescence)	2	PPT	LCD
4.6	Redox Potential – Chloroplast bioenergetics.	3	Chalk & Talk	Green Board
Biostatistics				
UNIT V				
5.1	Introduction- Basic concepts of biostatistics	2	Chalk & Talk	Green Board
5.2	Collection, tabulation and interpretation of data	3	Chalk & Talk	Green Board
5.3	Measures of central tendencies (Mean, Median, Mode)	3	Chalk & Talk	Green Board
5.4	Measures of dispersion (Standard deviation and standard error)	4	Chalk & Talk	Green Board
	Total	**60**		

Course Designer
(Name of the Course Teacher)

Head of the Department

Dr. V. RAMESH

Dr. V. RAMESH

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 – 23 and after)

PART – III : Core Course Theory		SEMESTER - III
Course Title: Genetics and Bioinformatics		
Course Code: 08CT32	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To understand the concepts of Mendelian inheritance, its deviation, multiple and polygenic inheritance
- To understand the basics of informatics used in Biology
- To familiarize the concepts of biological databases their applications through bioinformatics tools.

Course Outcome

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	To acquire the knowledge on laws of inheritance	K1, K2 & K3
CO2	To understand the concept of multiple alleles, recombination and sex determination	K1, K2 & K3
CO3	To gain the knowledge of extra chromosomal inheritance, mutation and gene regulation	K1, K2 & K3
CO4	To remember the basics of databases of NCBI	K1, K2 & K3
CO5	To apply the skills to analyze gene sequences and Phylogeny	K1, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT NO	**CONTENT**	**HOURS**

Unit – I	Introduction to Genetics - Mendelian inheritance – Mendels'laws - law of dominance – Incomplete dominance: law of segregation - law of independent assortment – monohybrid cross - dihybrid cross - back and test crosses – Interaction of genes: complementary genes - epistasis	**12**
Unit – II	Multiple alleles with reference to A, B, O & AB blood groups in man - Linkage - crossing over - mechanism of crossing over and significance – Mechanism of sex determination in plants.	**12**
Unit – III	Sex linked inheritance – Extrachromosomal inheritance – Male sterility in Maize – plastid inheritance – Mutation - Chromosomal aberrations and its types – genetic significance of mutations – mutagens – Human genome project – Gene regulation in prokaryotes (Operon Concept).	**12**
Unit – IV	Bioinformatics – Introduction, Terminologies used in bioinformatics – National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST)	**12**
Unit – V	Introduction and Salient Features of EMBL Nucleotide Sequence Database (EMBL-Bank), DNA Data Bank of Japan (DDBJ), Swiss-Prot - Sequence Alignments, Multiple Sequence Alignment (MSA), MSA by CLUSTALW - Phylogenetic tree Constructions - Applications of bioinformatics.	**12**

CLO with PLO Mapping

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**
CLO1	9	9	9	3	3	3	3
CLO2	9	9	9	3	9	3	1
CLO3	9	9	9	9	3	3	1
CLO4	9	3	9	9	3	3	3
CLO5	9	3	9	9	3	3	3

9-Strong**; 3**-Medium**; 1**-Low

CLO with PSO Mapping

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CLO1	9	3	1	3	3
CLO2	3	3	3	3	3
CLO3	3	3	3	3	3
CLO4	3	9	3	9	9
CLO5	3	9	3	9	9

9-Strong**; 3**-Medium**; 1**-Low

Text Books:

1. Elements of genetics – Rastogi Veer Bala, Kedarath Ramnath, Meerut, 2020 Ed.
2. Genetics and Molecular biology – Veer Bala Rastogi, Kedarnath, Ramnats, Meerut, 2013 Ed.
3. Bioinformatics - B.G. Curran, CBS Publishers PVT Ltd, New Delhi, 2012 Ed.

Reference Books:

1. Principles of Genetics – E.J. Gardner, Wiley Eastern Company, 2013 Ed
2. Human Genetics – Prentice Hall of India - Victor A. McKusick, PHI, 2010 Ed.
3. Bioinformatics - John De Britto A., St. Xavier's College (Autonomous), Palayamkottai, India, 2011.

Online Resources:

1. https://nptel.ac.in/courses/102/103/102103044/ (Bioinformatics Tools)
2. https://onlinecourses.swayam2.ac.in/cec21_bt02/preview (**The definition of endemism**)
3. https://nptel.ac.in/content/storage2/courses/downloads_new/102104068/noc19_bt32_assignment_Week_6.pdf (Conservation Genetics)
4. https://nptel.ac.in/content/storage2/courses/102103012/pdf/mod2.pdf (Chromosome structure and organization)
5. https://www.merriam-webster.com/dictionary/bioinformatics **(Definition of *bioinformatics*)**
6. https://nptel.ac.in/courses/102/106/102106065/ (Concepts and importance of Bioinformatics)
7. https://www.genome.gov/genetics-glossary/DNA-Sequencing (DNA sequencing)

Pedagogy

Chalk & Talk, PPT, Experiment

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, Permanent Slide, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
UNIT I				
1.1	Introduction to Genetics	1	Calk & Talk	Green Board
1.2	Mendelian inheritance	1	Calk & Talk	Green Board
1.3	Mendels'laws - law of dominance – incomplete dominance	2	Calk & Talk	Chart
1.4	Law of segregation	1	Calk & Talk	Green Board
1.5	Law of independent assortment	2	Calk & Talk	Chart & Green Board
1.6	Monohybrid cross	1	Calk & Talk	Chart & Green Board
1.7	Dihybrid cross	2	Calk & Talk	Green Board
1.8	Back and test crosses	1	Calk & Talk	Chart & Green Board
1.9	Complementary genes - Epistasis	1	Calk & Talk	Chart & Green Board

Unit – II				
2.1	Multiple alleles with reference to A, B, O blood groups in man.	4	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.2	Linkage and Crossing over theories	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.3	Linkage and Crossing significance	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.4	Mechanism of sex determination in plants.	2	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
Unit – III				
3.1	Sex linked inheritance – Extrachromosomal inheritance – Male sterility in Maize – plastid inheritance – Chromosomal aberrations and its types – Mutations – genetic significance of mutations – mutagens – Human genome project – Gene regulation in prokaryotes.	3	Calk & Talk	Chart, Plant material & Green Board
3.2	Male sterility in Maize – plastid inheritance	3	Calk & Talk	Chart, Plant material & Green Board
3.3	Chromosomal aberrations and its types – Mutations – genetic significance of mutations – mutagens –	3	Calk & Talk	Chart, Plant material & Green Board
3.4	Human genome project – Gene regulation in prokaryotes.	3	Calk & Talk	Chart, Plant material & Green Board
Unit – IV				
4.1	Bioinformatics – Introduction, Terminologies used in bioinformatics	3	Calk & Talk	Chart, Plant material & Green Board
4.2	National Center for Biotechnology Information (NCBI)	3	Calk & Talk	Green Board
4.3	Tools and Databases of NCBI & Database Retrieval Tool,	3	Calk & Talk	Green Board
4.4	Sequence Submission to NCBI, Basic local alignment search tool (BLAST)	3	Calk & Talk	Green Board
Unit – V				
5.1	Introduction and Salient Features of EMBL Nucleotide Sequence Database (EMBL-Bank)	2	Calk & Talk	Green Board
5.2	DNA Data Bank of Japan (DDBJ), Swiss-Prot	2	Calk & Talk	Green Board & Specimen
5.3	Sequence Alignments, Multiple Sequence Alignment (MSA), MSA by	2	Calk & Talk	Green Board & Plant material

	CLUSTALW			
5.4	Phylogenetic tree Constructions	2	Calk & Talk	Green Board
5.5	Applications of bioinformatics.	2	Calk & Talk	Green Board
Total		60		

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. T. SELLATHURAI	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 - 23 and after)

PART – IV : Skill Enhancement Course		SEMESTER - III
Course Title: Bio-Analytical Techniques		
Course Code: 08SB31	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Objectives

- To acquire practical knowledge of using various instruments and carry out experiments with them
- To know the principles of instruments used in biology
- To know the importance of bioinstruments

UNIT I

Principles of microscopy: Light microscopy, compound microscopy - Transmission and Scanning electron microscopy: Brief account on sample preparation for electron microscopy, Use in biological research – Micrometry: ocular and stage

UNIT II

Spectrophotometry: Calorimeter & UV- Vis Spectrometer - basic principles and application - pH and pH meter – Buffers and its Properties - Applications.

UNIT III

Centrifugation - Differential and density gradient centrifugation, type of rotors, analytical centrifugation for estimation of mass of biological molecules, ultracentrifugation and applications

UNIT IV

Chromatographic techniques - Basic principles and Types: Paper chromatography; Column chromatography, TLC, GLC, HPLC, Affinity chromatography

UNIT V

Electrophoretic methods - Principles and types: Agarose gel electrophoresis, sodium dodecyl sulphate–polyacrylamide gel electrophoresis (SDS-PAGE) - Polymerase chain reaction (PCR)

Text Books:

1. Techniques in Biology – J. Jeyaraman, Higgin Bothams Ltd, 2010 Ed.
2. Research methodology for biological Science - N. Gurumani., MJP, Publishers, Chennai, 2011 Ed.
3. Biophysics and bioinstrumentation – N. Arumugam, Saras Publications, Nagercoil, 2013 Ed

Reference Books:

1. Practical Biochemistry – David. T. Plummer, THM, 2010 Ed.
2. A biologist's guide to principles and techniques of Practical Biochemistry - Goulding & Wilson, ELBS, 2010 Ed.
3. Instrumental analysis for science and technology – Weferren, Agrobios India, 2010 Ed.

Online Resources:

1. https://nptel.ac.in/courses/102/103/102103044/ (Microscopic Techniques, Spectroscopic Techniques, Electrophoretic Techniques & Chromatographic Techniques)

2. https://www.slideshare.net/SumatiHajela/ph-meter-179331797 (pH meter)

3.https://www.slideshare.net/khadeejaikram56/centrifugation-49732927 Centrifugation)

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 - 23 and after)

PART – III : Core Course Theory		SEMESTER - IV
Course Title: Cell biology and Embryology		
Course Code: 08CT41	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To understand the modern concept of cell structure, components and function
- To apply knowledge from cell biology in biotechnology
- To acquire knowledge on the development of embryo in plant

Course Outcome

On the successful completion of the course, students will be able

Number	**Course Outcome**	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	To differentiate the structure and functions of cell organelles and cell membrane	K, K2 & K3
CO2	To critically analyze the process of cell cycle, cell divisions and its significance	K, K2 & K3
CO3	To acquire the knowledge of male reproductive structure and	K, K2 & K3

	developments in plants	
CO4	To recollect the female reproductive structure and developments in plants	K, K2 & K3
CO5	To appraise the structure and development of endosperm and embryo	K, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT	CONTENT	HOURS
Unit – I	Plant Cell structure - structure and functions of the following Cell membrane, Mitochondria, Chloroplast, Ribosome, Endoplasmic reticulum and Golgi complex	**12**
Unit – II	Nucleus: structure and function - chromosomes: structure and function, giant chromosomes (Polytene and Lampbrush chromosomes) - Cell cycle, Cell division: Mitosis, meiosis and their significance.	**12**
Unit – III	Microsporogenesis: Development of microsporangium, Structure of anther, pollen grain structure and development of male gametophyte.	**12**
Unit – IV	Megasporogenesis: Structure of ovule, types and development of embryosac - (*Polygonum, Allium, Peperomia)* Pollination, Fertilization: double fertilization and its significance.	**12**
Unit – V	Endosperm – types of endosperm (nuclear, cellular and helobial) and its significance – Embryo: development of dicot embryo (*Capsella* type*)*, development of monocot embryo (*Luzula* type)	**12**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	9	1	1	9	9	3	9
CLO 2	9	1	1	3	3	1	9
CLO 3	9	1	1	9	9	3	9
CLO 4	9	1	1	9	9	3	9
CLO 5	9	1	1	3	9	9	9

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PO

	PO1	PO2	PO3	PO4	PO5

CLO1	9	1	3	9	9
CLO2	9	1	3	9	3
CLO3	9	3	9	9	9
CLO4	9	1	9	9	9
CLO5	3	1	9	9	9

3-Strong**; 2**-Medium**; 1**-Low

Text Books:

1. Cell Biology, Genetics & Molecular Biology – Dipak Kumar Kar, New Central Book Agency, Delhi 2013 Ed
2. Embryology of Angisperms – P.S. Verma, Rastogi Pub. Meerut, 2012 Ed.
3. Molecular cell Biology- CB. Power, Himalaya Pub, New Delhi, 2013 Ed.

Reference Books:

1. Cell and Molecular Biology – SP. Vyas, CBS Publishers Pvt.Ltd, New Delhi, 2013 Ed.
2. Cytogenetics – PA. Gupta, Rastogi Pub. Meerut, 2013 Ed.
3. Cell and Molecular biology – S.P. Vyas, CBS Pub, Chennai, 2013 Ed.

Online Resources:

1. **https://onlinecourses.swayam2.ac.in/cec20_ma14/unit?unit=67&lesson=70 (Cell Biology Unit 1 & 2)**
2. **https://onlinecourses.nptel.ac.in/noc20_bt36/course (Plant Embryology)**
3. https://www.brainkart.com/article/Post-Fertilization-structure-and-events_38204/ (Fertilization, Endosperm and Dicot embryo development)
4. **https://www.slideshare.net/naveenagirish/monocot-and-dicot-navi (Embryogenesis)**
5. **https://www.slideshare.net/jayakar/embryogenesis (Monocot Embryo development)**

Pedagogy

Chalk & Talk, PPT, Experiment

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, Permanent Slide, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
UNIT I				
1.1	Plant Cell structure -	1	Calk & Talk	Green Board
1.2	Differences between eukaryotic and Prokaryotic cells.	1	Calk & Talk	Green Board
1.3	Cell membrane	2	Calk & Talk	Chart
1.4	Golgi complex, Mitochondria,	2	Calk & Talk	Green Board
1.5	Chloroplast	2	Calk & Talk	Chart & Green Board
1.6	Endoplasmic reticulum	2	Calk & Talk	Chart & Green Board

1.8	Ribosomes	2	Calk & Talk	Chart & Green Board
Unit – II				
2.1	Structure of Nucleus& chromosomes	2	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.2	Cell cycle introduction Cell division types - Mitosis and meiosis and their significance.	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.3	Cell division types	3	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.4	Mitosis and its significance.	2	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
2.5	Meiosis and its significance.	2	Calk & Talk	Chart, Online virtual Lab , Plant material & Green Board
Unit – III				
3.1	Structure of microsporangium,	3	Calk & Talk	Chart, Plant material & Green Board
3.2	Microsporogenesis	3	Calk & Talk	Chart, Plant material & Green Board
3.3	Development male gametophyte.	3	Calk & Talk	Chart, Plant material & Green Board
3.4	Summary of male organ development	3	Calk & Talk	Chart, Plant material & Green Board
Unit – IV				
4.1	Structure of megasporanigium, megasporogenesis, formation of female gametophytes (*Polygonum, Allium, Peperomia)* and Fertilization.	3	Calk & Talk	Chart, Plant material & Green Board
4.2	Megasporogenesis,	3	Calk & Talk	Green Board
4.3	Formation of female gametophytes (*Polygonum, Allium, Peperomia)*	3	Calk & Talk	Green Board
4.4	Process of Fertilization and post fertilization changes	3	Calk & Talk	Green Board
Unit – V				
5.1	Endosperm – types	2	Calk & Talk	Green Board
5.2	Endosperm – formation and significance	3	Calk & Talk	Green Board & Specimen
5.3	Embryo – Development of dicot embryo – *Capsella,*	3	Calk & Talk	Green Board & Plant material
5.4	Development of monocot embryo –	3	Calk & Talk	Green Board

	Luzula			
5.5	Summary of endosperm and embryo development	1	Calk & Talk	Green Board
Total		60		

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 -23 and after)

PART – III : Core Course Theory		SEMESTER - IV
Course Title: Plant Ecology		
Course Code: 08CT42	Hours per week:4	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To create an awareness among the students on environmental problems and conservation
- To help the learners to understand the hazards of pesticides

- Understand the principles of Phytogeography of various ways of plant distribution

Course Outcomes (CO)

On the successful completion of the course, students will be able

Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO1	To learn components of ecosystem and its factors	K1, K 2 /K3
CO2	To compare the different plant groups and plant succession	K1, K 2 /K3
CO3	To apply the quadret method for vegetation analysis	K1, K 2 /K3
CO4	To gain the impact of pesticides in living organisms	K1, K 2 /K3
CO5	To remember the concept of phytogeography	K1, K 2 /K3

K1-knowledge **K2**-Understand **K3**-Apply

Syllabus

UNIT No	CONTENT	HOURS
Unit-I	**ECOLOGY AND THE ENVIRONMENT** Ecology: Definitions, divisions and ecosystem: definitions and components of ecosystem - Ecological Factors: a) Climatic factors – Light, Temperature and wind - b) Biotic factors – interaction among plants, interaction between plants and animals - c) Edaphic factor – Composition of soil – Origin and formation of soil – soil profile – soil erosion and soil conservation.	**12**
Unit- II	**ECOLOGICAL GROUPS AND SUCCESSION** a) Ecological groups: Definitions, Classification & Adaptations of Xerophytes, Hydrophytes and Halophytes b) Succession: Kinds of succession – Process of succession – Types of succession – Xerosere and Hydrosere	**12**
Unit- III	**POPULATION ECOLOGY** a) Definitions – Ecotypes, its characteristics, formation and origin of new ecotypes, delimitation of ecotypes, significance of ecotypes – Ecoclines b) Methods of studying vegetation – Quadrat method only	**12**
Unit-IV	**ECO-TOXICOLOGY** Hazards of pesticides – Effects of pesticides on animal life – effects on plants – effects on human life.	**12**
Unit- V	**PHYTOGEOGRAPHY** Distribution of plants – continuous and discontinuous distribution – Continental drift - Endemism – Age and Area hypothesis.	**12**

Mapping of CLO with PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	9	3	3	3	9	9	3
CLO2	3	9	9	9	9	9	3
CLO3	3	3	3	9	9	9	3
CLO4	3	9	9	9	9	9	3
CLO5	9	9	3	3	9	9	3

9-Strong**; 3**-Medium**; 1**-Low

Mapping of CLO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	9	3	3	3	9
CLO2	9	3	3	9	3
CLO3	9	3	3	9	9
CLO4	3	3	3	9	9
CLO5	9	3	3	9	3

9-Strong**; 3**-Medium**; 1**-Low

Text Books:

1. Plant Ecology - Shukla & Chandel, S. Chand & Company, 2013 Ed.
2. Environmental science and engineering – P. Venugobal Rao, PHI Learning, New Delhi, 2010 Ed.
3. Fundamentals of Ecology - Eugene P Odum, Oxford & IBH, 2013 Ed.

Reference Books:

1. Environmental studies – SK.Grarg, Khanna Pub Delhi, 2012 Ed.
2. Plant Ecology – RS. Ambasht, Students Friends & Co, 2010 Ed.
3. Environmental Pollution and Toxicology - Ray Chandhuri & Gupta, periodical experts Book Agency, 2013 Ed.

Pedagogy

Chalk & Talk, Group Discussion, PPT

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Content and Lecture Schedule

	Topic	No. of	Content	Teaching

Module No.		Lectures	Delivery Method	Aids
Unit -1				
1.1	Ecology ad ecosystem-Definition and types and ecological parameters	1	Discussion	Green Board
1.2	Introduce ecological factors	1	Discussion	Green Board
1.3	Climatic factors – Light,	1	Lecture	Green Board
1.4	Temperature and wind	1	Lecture	Green Board
1.5	Biotic factors	1	Discussion	Green Board
1.6	Interaction among plants	1	Chalk & Talk	Green Board
1.7	Interaction between plants and animal	1	Lecture	Green Board
1.8	Stucture of edaphic factor	1	Lecture	Green Board
1.9	Composition of soil	1	Chalk & Talk	Green Board
1.10	Origin and formation of soil	1	Chalk & Talk	Green Board
1.11	Structure of soil profile	1	Discussion	LCD
1.12	Soil erosion and soil conservation.	1	Chalk & Talk	Green Board
Unit -2				
2.0	Ecological groups and succession	1	Lecture	Green Board
2.1	Ecological groups – Xerophytes,	2	Chalk & Talk	Green Board
2.2	Explain the hydrophytes	2	Chalk & Talk	Green Board
2.3	Explain the halophytes	2	Chalk & Talk	Green Board
2.4	Structure of succession	2	Chalk & Talk	Green Board
2.5	Process of succession – types of succession - xerosere and hydrosere	3	Chalk & Talk	Green Board
Unit -3				
3.0	Definitions – Ecotypes, its characteristics,	2	Chalk & Talk	Green Board
3.1	Formation and origin of new ecotypes,	3	Chalk & Talk	Green Board
3.2	Delimitation of ecotypes, significance of ecotypes – Ecoclines	3	PPT	LCD
3.3	Methods of studying vegetation – Quadrat method only	4	PPT	LCD
Unit -4				
4.0	Eco - toxicology in hazards of pesticides	2	Discussion	Green Board
4.1	Effects of pesticides on animal life	3	Chalk & Talk	Green Board

4.2	Effects of pesticides on plants	4	Chalk & Talk	Green Board
4.3	Effects of pesticides on human life	3	Chalk & Talk	Green Board
Unit -5				
5.0	Introduction about phytogeography	2	Lecture	Green Board
5.1	Distribution of plants	2	Chalk & Talk	Green Board
5.2	Distribution of plants – continuous and discontinuous distribution	2	Chalk & Talk	Green Board
5.3	Discuss the Continental drift	3	Chalk & Talk	Green Board
5.4	Endemism – Age and Area hypothesis.	3	Chalk & Talk	Green Board
	Total	**60**		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. T. SELLATHURAI	**Dr. V. RAMESH**

(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Lab		SEMESTER - IV
Course Title: Biochemistry, Biophysics, Biometrics, Genetics, Bioinformatics, Cell Biology, Embryology and Plant Ecology		
Course Code: 08CP43	Hours per week:2	Credit:4
CIA Marks: 40	ESE Marks: 60	Total Marks: 100

Preamble

- To analyze the biochemical properties of given sample
- To acquire the knowledge and applications of biostatistics
- To know the organization of plant cell, embryology and ecology of plant

Course Outcomes (CO)

On the successful completion of the course, students will be able

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO 1	To explain and formulate the biochemical experiments	K2
CO2	To analyze the biochemical experiments	K3
CO3	To apply statistical tools and categorize the genetical problems	K3
CO 4	To identify the cell organelles and embryological characters of the plants	K3
CO 5	To identify the ecological characters	K3

K1-knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT No.	CONTENT	HOURS
UNIT I	1. Determination of Complementary Colors 2. Verification of Beer's Law 3. Preparation of Buffers Solution at different molar concentration and measurement of pH 4. Titration curve of weak acid 5. Titration curve of Strong acid 6. Preparation of standard graph for starch 7. Estimation of Protein in a given material	**12**
UNIT II	8. Estimation of starch in a given material 9. Circular paper chromatography – Dyes 10. Quantitative estimation of Plant Pigments using Spectrophotometer 11. Spectrophotometric estimation of Isolated DNA 12. Separation of Proteins by Sodium Dodecyl sulfate – Polyacrylamide Gel Electrophoresis (SDS-PAGE)	**18**

	13. Qualitative Test for carbohydrates and Protein (Any 10 in unit I & unit 2)	
UNIT III	14. Calculate the standard deviation of the given material 15. Genetics problems 16. Observing and identifying the spotters at sight and writing explanatory notes on them – Bioinformatics Photographs	**6**
UNIT IV	17. Cell organelles (slides only) 18. Non-living inclusions – Raphides & cystolith (Slides only) 19. T.S. of anther to study various stages of Microsporogenesis (Slides only) 20. Types of ovules (Slides only) 21. Onion Root tip squash to observe mitosis cell division 22. Study of polyploidy in onion root tips 23. Embryo mounting – *Cucumis*	**12**
UNIT V	22. To determine the quantitative characters in the community by using quadrat method a) Frequency b) Abundance c) Density 24. Study of xerophytes, hydrophytes and halophytes (Photographs only) 25. Internal structure of *Nerium* leaf, *Casuarina* stem, *Hydrilla* stem and *Nymphaea* petiole 24. Field visit – Report preparation on vegetation types, conservation measures under taken in biosphere reserves/ national parks/ sanctuaries etc.	**12**

Mapping of CLO with PLO

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**
CLO1	9	3	3	3	9	9	3
CLO2	3	9	9	9	9	9	3
CLO3	3	3	3	9	9	9	3
CLO4	3	9	9	9	9	9	3
CLO5	9	9	3	3	9	9	3

9-Strong**; 3**-Medium**; 1**-Low

Mapping of CO with PSO

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CLO1	9	3	3	3	9
CLO2	9	3	3	9	3
CLO3	9	3	3	9	9
CLO4	3	3	3	9	9
CLO5	9	3	3	9	3

9-Strong**; 3**-Medium**; 1**-Low

Text Books

1. Laboratory Manual in Biochemistry - J. Jeyaraman, Wiley Eastern Ltd.
2. Phytochemical Methods. A guide to modern techniques of Plant Analysis - Harborne, J.B. (1998). Chapman and Hall Publication, London
3. Fundamentals of Ecology - Odum EP Barrett Gary, W. Brooks/Cole, 2004.
4. Embryology of Angiosperms - Johri, B.M. l (1984), Springer-Verlag, Netherlands.
5. Practical Mannual on Plant Cytogenetics - Singh, R.J. (2017). CRC Press, Boca Raton, Florida, USA.

Reference Books

1. Biochemistry and Molecular biology of Plants - Buchanan B.B. Gruissem W Jones RL. IK, International Publishers, New Delhi. 2000.
2. Practical Biochemistry - Keithwilson & John Walkar, Cambridge University Press.
3. A Text Book of Plant Ecology - Shukla RS Chandal PS, S.Chand Publishers, 2009.
4. The Embryology of Angiosperms - Bhojwani, S.S. and Bhatnagar, S.P. (2011). Vikas Publishing House. Delhi.
5. Cell Biology - Karp, G. (2010) John Wiley & Sons, U.S.A. 6th edition.

Online Resources

1. http://www.biology.arizona.edu/Cell_bio/activities/cell_cycle/cell_cycle.html (Onion Root Tip: Mitosis)
2. http://virtualbiologylab.org/membranes/ (Cell Membranes)
3. https://vlab.amrita.edu/?sub=3&brch=311 (Bioinformtics)
4. https://vlab.amrita.edu/?sub=3&brch=63 (Biochemistry)
5. https://vlab.amrita.edu/?sub=3&brch=187 (Cell Biology)
6. https://vlab.amrita.edu/?sub=3&brch=272 (Plant Ecology)

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT I				
1.1	Determination of Complementary colours	3	Chalk & Talk	Green Board, Instrument, Glassware & chemicals
1.2	Verification of Beer's Law	2		
1.3	Preparation of Buffers & measurement of pH	2		
1.4	Titration curve of weak acid	2		
1.5	Titration curve of Strong acid			
1.5	Preparation of standard graph for starch & Estimation of Protein in a given material	3		

UNIT II				
2.1	Estimation of starch in a given material	4	Chalk & Talk	Green Board, Instrument, Glassware & chemicals
2.2	Circular paper chromatography – Dyes	2		
2.3	Quantitative estimation of Plant Pigments using Spectrophotometer	4		
2.4	Separation of Spectrometric Estimation of Isolated DNA	4		
2.5	Separation of Proteins by Sodium Dodecyl sulfate – Polyacrylamide Gel Electrophoresis (SDS-PAGE) Qualitative Test for carbohydrates and Protein	4		
UNIT III				
3.1	Calculate the standard deviation of the given material	2	Chalk & Talk	Green Board, Vegetation
3.2	Genetics problems	2	Chalk & Talk	Green Board, Vegetation
3.3	Observing and identifying the spotters at sight and writing explanatory notes on them – Bioinformatics Photographs	2	Chalk & Talk	Green Board, Photos, Plant materials
UNIT IV				
4.1	1. Cell organelles (slides only) 2. Non-living inclusion – Raphides & cystolith (Slides only)	2	Chalk & Talk	Green Board, Microscope, Photos, Plant materials
4.2	T.S. of anther to study various stages of Microsporogenesis (Slides only)	2	Chalk & Talk	Green Board, Microscope, Photos, Plant materials
4.3	Types of ovules (Slides only)	2	Chalk & Talk	Green Board, Microscope, Photos, Plant materials
4.4	Onion Root tip squash to observe mitosis cell division	2	Chalk & Talk	Green Board, Microscope, Specimen, Plant materials
4.5	Study of polyploidy in onion root tips	2	Chalk & Talk	Green Board, Microscope,

				Photos, Specimen
4.6	Embryo mounting – *Cucumis*	2	Chalk & Talk	Green Board, Microscope, Photos, Specimen,
UNIT V				
5.1	To determine the quantitative characters in the community by using quadrat method. a) Frequency b) abundance c) density	4	Chalk & Talk	Photographs Green Board, Microscope, Specimen
5.2	Study of Xerophytes, hydrophytes and halophytes Internal structure of *Nerium* leaf, *Casuarina* stem, *Hydrilla* stem and *Nymphaea* petiole	4	Chalk & Talk	Green Board, Microscope, Specimen
5.3	Field visit – Report preparation on vegetation types, conservation measures under taken in biosphere reserves/ national parks/ sanctuaries etc.	4	Filed	Green Board, Microscope, Specimen

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 -23 and after)

PART – IV : Skill Enhancement Course		SEMESTER - IV
Course Title: **Horticulture and Plant Breeding**		
Course Code: 08SB41	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To provide theoretical and practical aspects of gardening to enable the students to be self reliant knowledge and self employment
- To know the various types of eco friendly environment in front of homes and improvement of innovative garden
- To know the simple practice for the plant breeding techniques
-

CO Number	**Course Outcome**	**Knowledge Level (according to Bloom's Taxonomy)**
CO 1	To gain the knowledge of Horticultural techniques	K1, K2 & K3
CO2	To acquire the basic knowledge of cultural practices	K1, K2 & K3
CO3	To develop the knowledge of Horticultural operations	K1, K2 & K3
CO 4	To develop the skill on plant breeding techniques	K1, K2 & K3
CO 5	To gain the knowledge on plant hybridization techniques	K1, K2 & K3

Syllabus

UNIT No.	**CONTENT**	**HOURS**
Unit-I	Introduction to Horticulture - types of gardening: indoor, public and dam gardens - Propagation techniques: Cutting, layering & grafting	**6**
Unit- II	Cultural practices: Transplanting methods (bare rooted, shifting and balling, burlapping, potting and repotting) irrigation and manuring	**6**
Unit- III	Horticultural techniques: disbudding, ringing, notching, smudging and pruning - Kitchen gardening - layout and maintenance – rockery - Bonsai and lawn	**6**
Unit-IV	Introduction of Plant Breeding – Aims and procedure for plant	**6**

	introduction - acclimatization – achievements in plant introduction – selection methods: Mass selection, pure line selection	
Unit- V	Hybridization and its methods: Interaspecific hybridization, Interspecific hybridization, - Heterosis and methods of Heterosis breeding - Ploidy breeding: Types of polyploids, methods to induce polyploidy – mutation breeding: types, advantages and disadvantages	**6**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	**9**	**3**	**3**	**9**	**3**	**3**	**3**
CLO 2	**9**	**3**	**9**	**3**	**3**	**9**	**9**
CLO 3	**9**	**9**	**1**	**3**	**9**	**3**	**3**
CLO 4	**9**	**1**	**9**	**3**	**9**	**3**	**9**
CLO 5	**9**	**9**	**9**	**3**	**3**	**9**	**3**

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CLO 1	**9**	**3**	**9**	**9**	**3**
CLO 2	**9**	**3**	**9**	**9**	**3**
CLO 3	**9**	**9**	**9**	**3**	**3**
CLO 4	**9**	**9**	**9**	**9**	**3**
CLO 5	**9**	**3**	**9**	**3**	**9**

9-Strong **3**-Medium **1**-Low

Text Books

1. Horticulture – V.L. Sheela, MJ Publishers, 2013 Ed.
2. Horticulture at a glance – Amar singh, Kalyani Pub, Chennai, 2013 Ed.
3. Elementary Principles of Plant Breeding - H.K Chanduri, Oxford & IBM, 2013 Ed

Reference Books

1. Hand Book of Horticulture - K.L.Chaddhe, D.I and Pub. Agri, New Delhi, 2012 Ed.
2. Principles of Horticulture - S.Prasad, Agrobios, International Books, 2013 Ed.
3. Plant Breeding, biomet & biotech – Dijak Kumar, New Central Book Agency, New Delhi, 2010 Ed.

Online Resources:

1. **http://agrimoon.com/fundamentals-of-horticultur-pdf-book/**
2. **https://www.iaritoppers.com/p/horticulture-icar-ecourse-pdf-books.html**

3. http://agrimoon.com/horticulture-icar-ecourse-pdf-books/
4. http://www.freebookcentre.net/Biology/Agriculture-Books.html
5. https://gardenbeast.com/ebooks/
6. https://connectapharma.com/qsn1u1/39153d-horticulture-books-pdf

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. V. RAMESH	Dr. V. RAMESH

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 - 23 and after)

PART – III : Core Course Theory		SEMESTER - V
Course Title: Taxonomy of Angiosperms & Economic Botany		
Course Code: 08CT51	Hours per week:6	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble:

- To study the floral characters with an aim to identify the taxon authentically
- To prepare taxonomic keys with the help of morphological and floral characters
- To acquire knowledge on useful plant products and its proper application to wellbeing of human

Course outcome (CO)

On the successful completion of the course, students will be able

CO Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO1	To classify the Angiosperms based on their morphological characters	K1,K2 & K3
CO2	To apply the knowledge of herbarium preparation techniques and modern techniques	K1,K2 & K3
CO3	To distinguish the features and economic values of angiosperms	K1,K2 & K3
CO4	To demonstrate and point out the characters and values of flowering plants	K1,K2 & K3
CO5	To bring out the economic use of plants and processing methods	K1,K2 & K3

K1-Knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT NO	CONTENT	HOURS
Unit- I	Botanical Nomenclature – ICBN: and Classification: Bentham & Hooker - Merits and demerits, Engler & Prantl - Important terminologies in morphological features - Angiosperm	**15**

	Phylogeny Group (APG) classification outline only	
Unit- II	Botanical survey of India - field and herbarium techniques - Modern trends in taxonomy (Chemo & Numerical) – Digital taxonomy: E- flora & Digital Herbaria	**20**
Unit- III	Vegetative, floral characters and Economic importance of the following families: Annonaceae, Capparidaceae, Meliaceae, Rutaceae, Fabaceae (Caesalpinioideae and Mimosoideae), Cucurbitaceae and Apiaceae	**20**
Unit-IV	Distinguishing features and economic importance of the following families: Rubiaceae, Asteraceae, Apocynaceae (Asclepiadoideae), Solanaceae, Scrophulariaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae (Phyllanthaceae), Orchidaceae, Arecaceae & Poaceae.	**20**
Unit- V	Fibers and fiber yielding plants - Spices and condiments - Resins and gums - Processing and extraction of sugar & tea	**15**

Mapping of CLO with PLO

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**
CLO 1	9	9	3	9	3	9	3
CLO 2	9	9	3	9	9	9	3
CLO 3	9	9	3	9	9	9	3
CLO 4	9	9	3	9	3	9	3
CLO 5	9	3	3	9	3	9	3

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CLO 1	9	9	9	9	3
CLO 2	9	9	3	9	9
CLO 3	9	9	9	3	9
CLO 4	9	9	9	9	3
CLO 5	9	9	9	9	3

9-Strong **3**-Medium **1**-Low

Text Books:

1. Taxonomy of Angiosperms- B.P. Pandey, S.Chand & Company Ltd, Delhi, 2014 Ed.

2. Plant Taxonomy, Saxena and Saxena, A Pragti Edition, Pragati PVT Ltd, Meerut, 2017 Ed.
3. Economic Botany- Hill Albert T, Surjeet Publications, New Delhi, 2012 Ed.

Reference Books:

1. Morphology of Angiosperms – Eames Arthur.J, Surjeet Publications, New Delhi, 2014 Ed.
2. Economic Botany-B.P. Pandey, S Chand & Company Ltd, New Delhi, 2014 Ed.
3. Economic Botany, V Singh, PC Pande and DK Jain, Rastogi Publications, 2015 Ed.

Online Resources:

1. https://www.slideshare.net/Wabworld/angiosperms-flowering-plants-powerpoint-presentation (Taxonomy of angiosperms)
2. https://www.slideshare.net/bisharifa/botanical-nomenclature?next_slideshow=1 (Bionomial nomenclature)
3. https://www.slideshare.net/DrRaviPrasadRaoBoyin/angiosperm-classifications (Angiosperms classification)
4. https://www.slideshare.net/ManojJoshi12/bentham-and-hooker-classification (Bentham and Hooker classification)
5. https://www.slideshare.net/jayakar/engler-prantl-system-of-classification?next_slideshow=1 (Engler and Prantl classification)
6. https://www.slideshare.net/gkumarimahesh/chemotaxonomy-115163128 (Chemotaxonomy)
7. https://www.slideshare.net/bonnmengullo/herbarium-ppt (Herbarium preparation)
8. https://www.slideshare.net/BibianLalawmpuii/processing-of-tea (Tea processing)
9. https://www.slideshare.net/najjatariq/sugar-manufacturing-process (Sugar processing)

Pedagogy

Chalk & Talk, Group Discussion, PPT

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Content and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
Taxonomy of Angiosperms				
Unit - I				
1.1	Botanical Nomenclature	2	Chalk and talk	Green Board
1.2	Principles of classification	1	Chalk and talk	Green Board
1.3	Bentham & Hooker classifications of Angiosperms	3	Chalk and talk	Green Board
1.4	Merits and demerits of Bentham & Hooker classification of Angiosperms	2	Chalk and talk	Green Board
1.5	Engler & Prantl classifications of Angiosperms	3	Chalk and talk	Green Board
1.6	Merits and demerits of Engler & Prantl classification	1	Chalk and talk	Green Board
1.7	Important technologies in morphological features	3	Chalk and talk	Green Board
Unit – II				
2.1	ICBN	3	Chalk and talk	Green Board
2.2	Botanical survey of India	2	Chalk and talk	Green Board

2.3	Herbarium techniques	3	Chalk and talk	Green Board
2.4	Modern trends in taxonomy	3	Chalk & Talk	Green Board
2.5	Chemotaxonomy	3	Chalk & Talk	Green Board
2.6	Numerical taxonomy	3	Chalk & Talk	Green Board
2.7	Digital taxonomy	3	Chalk & Talk	Green Board
Unit –III : Distinguishing features and economic importance of following families				
3.1	Annonaceae	2	Chalk & Talk	Green Board
3.2	Capparidaceae	2	Chalk & talk	
3.3	Faboideae,	2	Chalk & Talk	Green Board
3.4	Meliaceae	2	Chalk & Talk	PPT
3.5	Rutaceae	2	Discussion	Green Board
3.6	Ceasalpinioideae	2	Chalk & Talk	Green Board
3.7	Mimosoideae	2	Chalk & Talk	Green Board
3.8	Cucurbitaceae	2	Chalk & Talk	Green Board
3.9	Apiaceae	2	Lecture	Green Board
Unit – IV: Distinguishing features and economic importance of following families				
4.1	Rubiaceae	2		
4.2	Asteraceae	2	Discussion	Green Board
4.3	Asclepiadoideae	2	Chalk & Talk	Green Board
4.4	Solanaceae	2	Chalk & Talk	Green Board
4.5	Scrophulariaceae	1	Chalk & Talk	Green Board
4.6	Lamiaceae	2	Lecture	Green Board
4.7	Amaranthaceae,	2	Chalk & Talk	Green Board
4.8	Euphorbiaceae	2	Chalk & Talk	Green Board
4.9	Orchidaceae	2	Chalk & Talk	Green Board
4.10	Arecaceae	1	Chalk & Talk	Green Board
4.11	Poaceae	2	Chalk & Talk	Green Board
Economic Botany				
Unit – V				
5.1	Fiber and fiber yielding plants	4	Lecture	Green Board
5.2	Spices and condiments	4	Chalk & Talk	Green Board
5.3	Resins and gums	3	Chalk & Talk	Green Board
5.4	Processing and extraction of sugar & tea	4	Chalk & Talk	Green Board
	Total	**90**		

Course Designer
(Name of the Course Teacher)
Dr. C. SOUNDAR RAJU

Head of the Department
Dr. V. RAMESH

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 – 23 and after)

PART – III : Core Course Theory		SEMESTER - V
Course Title: Plant Physiology		
Course Code: 08CT52	Hours per week:5	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To study the organization and physiology of plants
- To acquire the basic knowledge of cellular basis of physiological functions.
- To know the mechanism in plant metabolic activities such as photosynthesis, respiration and transpiration

Course Outcomes (CO)

On the successful completion of the course, students will be able

CO Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO 1	To gain the knowledge of plants and water relationship involved in transport of water	K1, K2 & K3
CO2	To understand the system on physiological mechanisms of metabolic growth in plants	K1, K2 & K3
CO3	To demonstrate the physiological mechanisms involved in biosynthesis of molecules	K1, K2 & K3
CO 4	To knowledge of plant nutrients for their development	K1, K2 & K3
CO 5	To apply the knowledge on physiological mechanisms of growth regulators in emerging the seedlings	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT No.	CONTENT	HOURS
UNIT I	**Plants and water relations:** a) Diffusion – osmosis – water potential concept – plasmolysis b) Mechanism of absorption of water – factors affecting absorption c) Transpiration – Types of transpiration – Mechanism of stomatal opening –significance of transpiration – Guttation. d) Ascent of Sap: Mechanism of water movement.	**15**
UNIT II	**Mineral nutrition** a) Role of macro and micro elements – mechanism of absorption of minerals. b) Mechanism of translocation of solutes - Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.	**15**
UNIT III	**Photosynthesis** a) Structure of Chloroplast and Chlorophyll pigments – light reaction: light harvesting complex; light absorption, composition and characteristics of two photosystems, photosynthetic electron transport – Dark reactions (C_3 and C_4 pathways) CAM plants – Photorespiration. b) Respiration – RQ – Mechanism [Glycolysis, Kreb's cycle – oxidative phosphorylation – Pentose phosphate shunt- fermentation.	**15**
UNIT IV	**Sensory photobiology** Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins - Photoperiodism, Biological clocks and Vernalization - Plant movements: Geotropism, Phototropism, Thigmotropism	**15**
UNIT V	**Growth and development** Growth – definition – Physiological effects of Growth hormones (Auxins, gibberellins, Cytokinins, Abscisic acid and ethylene) – Seed germination - Seed dormancy: Physical and Chemical methods of breaking seed dormancy.	**15**

Mapping of CLO with PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	9	9	9	9	3	9	3
CLO2	9	9	3	3	3	3	3
CLO3	3	3	3	3	3	9	9
CLO4	9	3	3	3	3	3	3
CLO5	9	9	3	3	3	3	3

9-Strong**; 3**-Medium**; 1**-Low

Mapping of CLO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	9	3	9	9	3
CLO2	3	3	9	9	3
CLO3	3	3	9	3	3
CLO4	3	3	9	3	9
CLO5	3	3	9	3	3

9-Strong**; 3**-Medium**; 1**-Low

Text Books

1. Plant Physiology – Suraj Mandal, Campus Books, New Delhi, 2014 Ed.
2. Plant Physiology – Ray Noggle .G, MJP Publishers, Chennai, 2010 Ed.
3. Plant Physiology - Jain, V.K, S.Chand & Company Ltd, Delhi, 2013 Ed.

Reference Books

1. Plant Physiology - Salisbury & Ross, C.B.S Publishers, Delhi, 2013 Ed.
2. Plant Physiology – G. Ray Noggle, PHI Learning, New Delhi, 2010 Ed.
3. Plant Physiology – Suraj Mandal, Campus Books, New Delhi, 2013 Ed.

Online Resources

1. **https://byjus.com/biology/plasmolysis/ plasmolysis**
2. **https://byjus.com/questions/explain-the-mechanism-of-opening-and-closing-of-stomata/**(Mechanism of stomata opening
3. https://www.livescience.com/51720-photosynthesis.html (Photosynthesis)
4. **https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/nitrogen-metabolism (**Nitrogen metabolism)

5. https://www.britannica.com/science/enzyme (Enzymes)
6. https://www.britannica.com/science/photoperiodism (Photoperiodism)

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT I				
Plants and water relations				
1.1	Diffusion- Osmosis	2	Discussion	
1.2	Water potential concept	1	Chalk & Talk	Green Board
1.3	Plasmolysis	1	Chalk & Talk	Green Board
1.4	Mechanism of absorption of water	3	Chalk & Talk	Green Board
1.5	Factors affecting absorption	1	PPT	LCD
1.6	Transpiration – Types of transpiration	2	PPT	LCD
1.7	Mechanism of stomatal opening- Significance of transpiration	2	Discussion	
1.8	Guttation	1	Chalk & Talk	Green Board
1.9	Ascent of Sap- Mechanism of water movement.	2	Chalk & Talk	Green Board
UNIT II				
2.1	Role of macro elements	2	Chalk & Talk	Green Board
2.2	Role of micro elements	2	Chalk & Talk	Green Board
2.3	Mechanism of absorption of minerals.	2	Chalk & Talk	Green Board
2.4	Mechanism of translocation of solutes	2	Chalk & Talk	Green Board
2.5	Composition of phloem sap, girdling experiment;	1	PPT	LCD
2.6	Pressure flow model;	2	PPT	LCD
2.7	Phloem loading and unloading.	4	Chalk & Talk	Green Board
UNIT III				
3.1	Photosynthesis: Structure of Chloroplast and Chlorophyll pigments	2	Chalk & Talk	Green Board
3.2	Light reaction – Dark reactions	2	PPT	LCD
3.3	C_3 and C_4 pathways	2	Chalk & Talk	Green Board
3.4	CAM Plants- Photorespiration	2	PPT	LCD
3.5	Respiration – RQ	2	Chalk & Talk	Green Board
3.6	Mechanism of glycolysis	2	Chalk & Talk	Green Board
3.7	Mechanism of Kreb's cycle, Oxidative	2	Chalk & Talk	Green Board

	Phosphorylation & Pentose phosphate shunt- Fermentation			
3.8	Pentose phosphate shunt- Fermentation	3	Chalk & Talk	Green Board
UNIT IV				
4.1	**Sensory photobiology** Structure, function and mechanisms of action of phytochromes	4	PPT	LCE
4.2	Structure, function and mechanisms of action of cryptochromes and phototropins	4	PPT	LCD
4.3	Photoperiodism, Biological clocks and Vernalization	4	Chalk & Talk	Green Board
4.4	Plant movements: Geotropism, Phototropism, Thigmotropism	3	PPT	LCD
UNIT V				
Growth and development				
5.1	Growth – definition- physiological effects of Growth hormones	1	Chalk & Talk	Green Board
5.2	Auxins	2	PPT	LCD
5.3	Gibberellins	2	PPT	LCD
5.4	Cytokinins	2	PPT	LCD
5.5	Ethylene	1	PPT	LCD
5.6	Abscisic acid	2	Chalk & Talk	Green Board
5.8	Vernalization.	1	Chalk & Talk	Green Board
5.9	Seed germination & Seed dormancy	4	Chalk & Talk	Green Board
	Total	**75**		

Course Designer
(Name of the Course Teacher)

Head of the Department

Dr. T. SELLATHURAI

Dr. V. RAMESH

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Theory		SEMESTER - V
Course Title: Microbiology		
Course Code: 08CT53	Hours per week:5	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire basic knowledge on micrLOCFs
- To know the importance of micrLOCFs in day today life.
- To know the value of immune system immunity

Course Outcome

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	To recall the contributions of microbiologists and diversity of micrLOCFs	K1, K2 & K3
CO2	To examine the nutritional characteristics and multiplication of micrLOCFs	K1, K2 & K3
CO3	To apply the concept of microbial controlling techniques	K1, K2 & K3
CO4	To assess the microbial photosynthesis and role of microorganisms in manufacturing of value added products	K1, K2 & K3
CO5	To gain the basic knowledge of immune system and antigen antibody reactions in biological systems	K1, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT NO	**CONTENT**	**HOURS**
Unit – I	Introduction to Microbiology – contributions of Anton Van Leeuwenhoek, Louis Pasteur, RLOCFrt Koch and his postulates - Microbial diversity – General features and structure of Bacteria, Viruses, Bacteriophage, Yeast and Cyanobacteria - Staining of Bacteria	**15**
Unit – II	Microbial growth - nutrient requirements - sources of nutrients – nutritional classification - culture media – measurement of growth – bacterial growth curve – role of antimicrobial agents on growth.	**15**
Unit – III	Control of micrLOCFs – basic aspects of sterilization, disinfection, antiseptic, sanitation, tyndallisation, pasteurization - Use of Physical methods (dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter) and Chemical methods (Phenolic compounds, alcohols, halogens, heavy metals, aldehydes) in sterilization process	**15**
Unit – IV	Microbial Metabolism – Photosynthesis – Light reactions of Purple	**15**

	Sulfur bacteria, Purple Non - Sulfur bacteria, Green Sulfur bacteria, Green Non-Sulfur bacteria – Lactic acid and Citric acid fermentation.	
Unit – V	Immunology- Brief account of Immune system: primary & secondary (Lymphoid organs, Lymphocytes, Phagocytes), Types of Antigen, Antibody Structure, Types and Function – Brief account of Antigen Antibody reaction – Vaccines	**15**

Mapping of CLO with PLO

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**
CLO 1	9	1	9	9	9	9	9
CLO 2	9	1	9	9	9	9	3
CLO 3	9	1	9	9	9	9	9
CLO 4	9	1	1	9	9	3	3
CLO 5	9	1	9	9	9	1	9

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CLO 1	9	9	3	9	9
CLO 2	3	3	9	9	9
CLO 3	1	9	9	9	9
CLO 4	3	3	9	9	9
CLO 5	1	1	1	9	3

9-Strong **3**-Medium **1**-Low

Text Books:

1. Microbiology and immunology – Ajit Kumar Banerjee, New Central Book Agency Delhi, 2012 Ed.
2. A text Book of Microbiology – R.C. Dubey, S.Chand & Company Ltd, Delhi, 2014 Ed.
3. Microbiology - S. Jeeva, Scitech Publications PVT. LTD, Chennai, 2010 Ed.

Reference Books:

1. Microbiology – R.P. Singh, Kalyani Publishers, Ludhiana, 2012 Ed.
2. Microbiology- L.M.Prescott, J.P.Harley, D.A. Klein, McGraw Hill, Hill Education India, 2010 Ed.
3. Microbiology - Michael J. Pelczar, McGraw Hill Education India, 2012 Ed.

Online Resources

1. https://www.slideshare.net/RAMESHVELCHAMY/introduction-to-microbiology-238350723 (Introduction To Microbiology)
2. https://www.slideshare.net/RAMESHVELCHAMY/general-features-and-structure-of-cyanobacteria (General Features and Structure of cyanobacteria) https://www.slideshare.net/RAMESHVELCHAMY/general-characters-and-structure-of-viruses (General Features and Structure Of Viruses)
3. https://www.slideshare.net/RAMESHVELCHAMY/general-features-and-structure-of-yeastppt (General Features and Structure of Fungi)
4. - https://www.slideshare.net/RAMESHVELCHAMY/structure-of-bacterial-cell-238356353 (Structure of Bacteria)
5. https://vlab.amrita.edu/?sub=3&brch=73&sim=208&cnt=1 (Staining Techniques)
6. https://www.slideshare.net/RAMESHVELCHAMY/nutrition-and-nutiritional-types-of-bacteria (Nutrition and Nutritional Types of Bacteria)
7. https://www.slideshare.net/RAMESHVELCHAMY/measurement-of-bacteruak-growth (Measurement of Bacterial Growth)
8. https://www.slideshare.net/RAMESHVELCHAMY/culture-media-238960762 (Preparation of Culture Media)
9. https://www.slideshare.net/RAMESHVELCHAMY/bacterial-growth-curve-238960758 (Bacterial Growth Curve)
10. https://www.slideshare.net/RAMESHVELCHAMY/control-of-micrLOCFs (Control of MicrLOCFs)

https://www.slideshare.net/RAMESHVELCHAMY/bacterial-photosynthesis-239049215 (Bacterial Photosynthesis)

11. https://www.slideshare.net/RAMESHVELCHAMY/citric-acid-production-239049232 (Citric acid Production)
12. https://vlab.amrita.edu/?sub=3&brch=69&sim=721&cnt=1 (Direct Elisa)

Pedagogy

Chalk & Talk, PPT, Experiment & on the spot teaching

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
UNIT I				
1.1	Introduction to Microbiology	4	Calk & Talk	Green Board & Online virtual Lab
1.2	Contributions of Anton Van Leeuwenhoek, Louis Pasteur, RLOCFrt Koch and his postulates	4	Calk & Talk	Green Board & Online virtual Lab
1.3	Microbial diversity – General features and structure of Bacteria, Viruses, Yeast and Cyanobacteria	4	Calk & Talk	Green Board & Online virtual Lab
1.4	Staining of Bacteria	3	Calk & Talk	Green Board Online virtual Lab
Unit – II				

2.1	Microbial growth - nutrient requirements & sources of nutrients	4	Calk & Talk	Green Board Online virtual Lab & PPT
2.2	Nutritional classification	3	Calk & Talk	Green Board Online virtual Lab & PPT
2.3	culture media – measurement of growth: Direct & indirect methods	4	Calk & Talk	Green Board Online virtual Lab & PPT
2.4	Bacterial growth curve – role of antimicrobial agents on growth.	4	Calk & Talk	Green Board, Online virtual Lab & PPT
Unit – III				
3.1	Control of micrLOCFs – basic aspects of sterilization,	3	Calk & Talk	Green Board, Online virtual Lab & PPT
3.2	Disinfection, antiseptic, sanitation, tyndallisation, pasteurization	4	Calk & Talk	Green Board, Online virtual Lab & PPT
3.3	Use of Physical methods (dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter)	4	Calk & Talk	Green Board, Online virtual Lab & PPT
3.4	Chemical methods (Phenolic compounds, alcohols, halogens, heavy metals, aldehydes) in sterilization process	4	Calk & Talk	Green Board, Online virtual Lab & PPT
Unit – IV				
4.1	Microbial Metabolism	4	Calk & Talk	Green Board, Online virtual Lab & PPT
4.2	Photosynthesis – Light reactions of Purple Sulfur bacteria	4	Calk & Talk	Green Board, Online virtual Lab & PPT
4.3	Purple Non - Sulfur bacteria, Green Sulfur bacteria	4	Calk & Talk	Green Board, Online virtual Lab & PPT
4.4	Lactic acid and Citric acid fermentation	3	Calk & Talk	Green Board, Online virtual Lab & PPT
Unit – V				
5.1	Immunology - Brief account of Immune system: primary & secondary	3	Calk & Talk	Green Board & PPT
5.2	Lymphoid organs, Lymphocytes, Phagocytes	3	Calk & Talk	Green Board & Smart class
5.3	Antigen: structure, properties & types	3	Calk & Talk	Green Board & PPT
5.4	Antibody Structure, Types and Function	3	Calk & Talk	Green Board & e-Content
5.5	Brief account of Antigen Antibody reaction & Vaccines	3	Calk & Talk	Green Board & PPT
Total		90		

Course Designer
(Name of the Course Teacher)

Head of the Department

Dr. V. RAMESH

Dr. V. RAMESH

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 – 23 and after)

PART – III : Discipline Specific Elective		SEMESTER - V
Course Title: Medicinal Botany		
Course Code: 08EP5A	Hours per week:5	Credit:5
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble:

- To understand the concept of traditional medicines
- To acquire knowledge on botanical diagnosis of fragmentary crude drugs
- To know the preliminary photochemistry of plant organs and identify medicinal taxon

Course outcome (CO)

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (according to Bloom's Taxonomy)**
CO1	To acquire the knowledge of traditional system of medicine	K1, K2 & K3
CO2	To explore skills on crude drugs preparation and evaluation	K1, K2 & K3
CO3	To gain the knowledge of plant derived secondary metabolites	K1, K2 & K3
CO4	To discuss the botanical description of medicinal plants	K1, K2 & K3

CO5	To apply the medicinal values of plants in day today life	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT NO	CONTENT	HOURS
Unit- I	Pharmacognosy – definition, scope, History, Indigenous system of medicine (Ayurveda, Siddha, Unani, Yoga, Naturopathy & Homoeopathy) – Classification of crude drugs (Alphabetical, Taxonomical, Morphological, Pharmacological, Chemical and Chemotaxonomical)	**15**
Unit- II	Collection and processing of crude drugs- harvesting, drying, garbling, packing and storage of crude drugs, Drugs adulteration- types of adulterants –methods of drug evaluation (Physical, chemical, biological and organoleptic) Evaluation and Pharmacopoeia standards.	**15**
Unit- III	Products derived from plants (Secondary metabolites) pharmaceutically important products, their classification, properties, isolation and medicinal uses of the following Alkaloids, Tannins, Phenols, Resins and gums	**15**
Unit-IV	Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of the following: Stem & Tuber - *Zingiber officinale* Bark & wood - *Cinnamomum verum, Santalum album* Leaves - *Cassia alexandrina* Buds & flowers - *Syzygium aromaticum* Fruits - *Aegle marmelos* Seeds - *Myristica fragrans* Resins and Gums - *Ferula asa-foetida*	**15**
Unit- V	Botanical name, common name, family, chemical constituents, and uses of the following Anticancer Plants – *Catharanthus roseus, Curcuma longa* Antidiabetic Plants – *Gymneme sylvestre, Costus igneus* Immunity Booster formulations – Nilavembu Kashayam, Kabasura Kudineer	**15**

Mapping of CLO with PLO

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**
CLO1	9	3	9	9	9	9	3
CLO2	9	9	3	9	3	3	3

CLO3	9	3	3	3	9	9	9
CLO4	9	3	9	3	9	9	9
CLO5	9	3	9	9	3	9	9

9-Strong**; 3**-Medium**; 1**-Low

Mapping of CLO with PSO

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CLO1	9	9	9	9	3
CLO2	3	3	9	9	3
CLO3	3	3	9	9	3
CLO4	9	3	9	9	9
CLO5	3	3	9	9	9

9-Strong**; 3**-Medium**; 1**-Low

Text Books:

1. Medicinal plants of India – SS. Lal, New Central Book Agency, Delhi, 2012 Ed.
2. Herbs cultivation and medicinal uses - H. Panda, NIIR Publication, N. Delhi, 2012 Ed.
3. Economic Botany - S.L. Kochar, MacMillan Indian Ltd.N.Delhi, 2010 Ed.

Reference Books

1. Economic Botany - F. Hill, Tata Mcgraw Hill Publishing com. N.Delhi, 2010 Ed.
2. Medicinal Plants-Anil Kumar, Inter. Sci. Publishing Academy, New Delhi, 2014 Ed.
3. Economic Botany – Albert F. Hill, Surjeet Publications, Delhi, 2012 Ed.

Online Resources

1. **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4204033/(**Pharmacognosy: Science of natural products in drug discovery)
2. https://everything.com/chemotaxonomy (CHEMOTAXONOMY|DEFINITION CLASSIFICATION SIGNIFICANCE)
3. **https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/secondary-metabolite (Secondary metabolites)**
4. https://www.sciencedirect.com/science/article/abs/pii/s0273230012000633 **(**guidelines and Pharmacopoeial standards for pharmaceutical impurities: overview and critical assessment**)**
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3459456/(Ferula *asafoetida*: Traditional uses and pharmacological activity)

6. https://www.webmd.com/vitamins/ai/ingredientmono-953/ashwagandha- (Withania somnifera - *Overview*)
7. **https://www.google.com/search?q=skm+nilavembu+kudineer**

Pedagogy
Chalk & Talk, Group Discussion, PPT
Teaching Aids
Green Board, LCD Projector, Interactive White Board

Course Content and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
	Unit -1			
1.0	Pharmocognosy – definition, scope, History	5	Discussion	Green Board
1.1	Indigenous system of medicine (Ayurveda, Unani & Siddha) and Chemotaxonomical)	5	Lecture	Green Board
1.2	Classification of crude drugs (Alphabetical, Taxonomical, Morphological, Pharmacological, Chemical and Chemotaxonomical)	5	Discuss	Green Board
	Unit -2			
2.0	Collection and processing of crude drugs- harvesting, drying, garbling, packing and storage of crude drugs	3	Lecture	Green Board
2.1	Drugs adulteration- types of adulterants	4	Chalk & Talk	Green Board
2.2	Methods of drug evaluation (Physical, chemical, biological and organoleptic)	4	Chalk & Talk	Green Board
2.3	Evaluation and Pharmacopoeia standards	4	Chalk & Talk	Green Board
	Unit -3			
3.0	Products derived from plants (Secondary metabolites)	3	Chalk & Talk	Green Board
3.1	Pharmaceutically important products, their classification, properties, isolation and medicinal uses of Alkaloids	4	Discussion	
3.2	Pharmaceutically important products, their classification, properties, isolation and medicinal uses of Tannins and phenols	4	Chalk & Talk	Green Board
3.3	Pharmaceutically important products, their classification, properties, isolation and medicinal uses of Resins and Gums	4	PPT	
	Unit -4			
4.0	Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal	3	Discussion	Green Board

	uses of Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of Stem & Tuber - *Zingiber officinale, Cinnamomum verum & Santalum album*			
4.1	Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of Leaves - *Cassia senna*	3	Chalk & Talk	Green Board
4.2	Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of Buds & flowers - *Syzygium aromaticum*	3	Chalk & Talk	Green Board
4.3	Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of Fruits - *Aegle marmelos*	2	Chalk & Talk	Green Board
4.4	Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of Seeds - *Myristica fragrans*	2	Lecture	Green Board
	Medicinal uses of lower plants – Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of Resins and Gums - *Ferula asa-foetida*	2		
	Unit -5			
5.0	Botanical name, common name, family, chemical constituents and uses of Anticancer Plants – *Catharanthus roseus, Curcuma longa*	4	Lecture	Green Board
5.1	Botanical name, common name, family, chemical constituents and uses of Antidiabetic Plants – *Gymneme sylvestre, Costus igneus*	4	Chalk & Talk	Green Board
5.2	Immunity Booster formulations – Nilavembu Kashayam	4	Chalk & Talk	Green Board
5.3	Immunity Booster formulations Kabasura Kudineer	3	Chalk & Talk	Green Board
	Total	**75**		

Course Designer **Head of the Department**

(Name of the Course Teacher)

Dr. T. SELLATHURAI **Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Discipline Specific Elective		SEMESTER - V
Course Title: Organic Farming		
Course Code: 08EP5B	Hours per week:5	Credit:5
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire the knowledge in the field of organic farming and their importance
- To identify the microorganisms as biocontrol agent
- To understand the different strategy in the crop production

Course Outcomes (CO)

On the successful completion of the course, students will be able

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO 1	To acquire the concept of organic farming	K1, K2 & K3
CO 2	To apply the skills to prepare manures for organic farming	K1, K2 & K3
CO 3	To learn the application of bio controlling agents	K1, K2 & K3
CO 4	To study the organic crop production practices and cultivation methods	K1, K2 & K3
CO 5	To create the advanced organic forming technique and certify the organic products	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

Mapping of CLO with PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	9	9	3	3	3	3	3
CLO2	3	3	9	9	9	9	9
CLO3	3	9	9	9	9	9	9
CLO4	3	3	9	9	9	9	9
CLO5	3	3	9	9	9	9	9

9-Strong**; 3**-Medium**; 1**-Low

Mapping of CLO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	3	3	3	9	9
CLO2	3	9	9	9	9
CLO3	3	9	9	9	9
CLO4	3	9	9	9	9
CLO5	3	9	9	9	9

9-Strong**; 3**-Medium**; 1**-Low

Syllabus

UNIT NO.	CONTENT	HOURS
UNIT I	Organic Farming: definition, types and role of farming - integrated farming system and mixed farming concept of different cropping systems	**15**
UNIT II	Composting: principles, methods, types and factors – sources of nutrients: farmyard manure - rural compost - city compost, oil cakes, animal wastes, types and method of vermicomposting - green manure – Panchagavya as foliar spray	**15**
UNIT III	Water and weed management practices – mulching and types: dry mulching, green mulching, live mulching & stone mulching	**15**
UNIT IV	Integrated plant protection management – biofence: definition and its companion plants – herbal pest repellants – neem and its formulations – bacterial and Fungal biocontrol agents	**15**
UNIT V	Organic products certification: guidelines - requirements – procedure – validity – labelling - marketing	**15**

Text Books

1. Dahama, A.K. (1997). Organic Farming for sustainable Agriculture, Second Enlarged Edition, Jodhpur.
2. Sambamurty, A.V.S.S. (2005). A Textbook of Algae, I.K. International Pvt. Ltd., New Delhi.
3. Sharma, P.D. (2012). Microbiology and Plant Pathology (3rd Edition), Rastogi Publications, Meerut.

Reference Books

1. Veeresh, G.K, Organic Farming, Foundation books Pvt. Ltd, New Delhi (2006).
2. Anindra Nag (2008). Textbook of Agricultural Biotechnology, PHI Learning Private Limited, New Delhi.
3. Vayas,S.C, Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

Online resources

1. **https://www.britannica.com/topic/organic-farming (Organic Farming** agriculture)
2. http://www.hillagric.ac.in/edu/coa/agronomy/lect/agron-711/Lecture%201%20Farming%20system%20scope%20importance%20and%20concept.pdf
3. https://www.epa.gov/recycle/composting-home (Composting)
4. https://agritech.tnau.ac.in/ta/org_farm/orgfarm_panchakavya.html (Panchakavya)

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT I				Green Board
1.1	Organic Farming: definition, types and roll of farming.	5	Chalk & Talk	Green Board
1.2	Pure organic farming - integrated farming system	5	Chalk & Talk	Green Board
1.3	Mixed farming concept of different cropping systems	5	Chalk & Talk	Green Board
UNIT II				
2.1	Composting- principles, methods, stages, types and factors.	3	Discussion	Green Board
2.2	Sources of nutrients for Organic Manure	3	Lecture	Green Board
2.3	Farmyard manure - rural compost - city compost, oil cakes, animal wastes	3	PPT	LCD
2.4	Types and method of vermicomposting	2	Lecture	
2.5	Green manure	2	Chalk & Talk	Green Board
2.6	Panchakavya and field Application	2	Chalk & Talk	Green Board
UNIT III				
3.1	Water and weed management practices	4	Lecture	Green Board
3.2	mulching and types	4	Discussion	Green Board
3.3	dry mulching, green mulching	4	PPT	LCD
3.4	live mulching & stone mulching	3	Chalk & Talk	Green Board
UNIT IV				
4.1	Integrated plant protection management	3	PPT	LCD
4.2	Biofence: definition and its companion plants	3	Chalk & Talk	Green Board
4.3	Herbal pest repellants	2		
4.4	Neem and its formulations	2	Lecture	Green Board
4.5	Bacterial biopesticides	2	Discussion	Green Board
4.6	Fungal biopesticides	3	Lecture	Green Board
UNIT V				
5.1	Organic crops certification	4	Discussion	Green Board
5.2	Guidelines - requirements	4	Lecture	Green Board
5.3	Procedure – validity	3	Discussion	Green Board
5.4	Labeling- organic crops marketing	4	Discussion	Green Board
	Total	**75**		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. T. SELLATHURAI	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2022 and after)

PART – IV : Skill Enhancement Course		SEMESTER - V
Course Title: Mushroom Cultivation		
Course Code: 0BSB51	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire basic knowledge on mushrooms
- To know the importance of mushrooms
- To know the value of mushrooms in day today life

Course Learning Outcomes

CO Number	**Course Outcome**	**Knowledge Level (according to Bloom's Taxonomy)**
CO 1	To gain the basic concepts of mushroom cultivation	K1, K2 & K3
CO2	To create and design on mushroom shed construction	K1, K2 & K3
CO3	To gain the basic knowledge of cultivation and harvesting techniques of mushroom	K1, K2 & K3
CO 4	To develop the skills on mushroom marketing	K1, K2 & K3
CO 5	To understand the nutrient profile of mushroom	K1, K2 & K3

Syllabus

UNIT	**CONTENT**	**HOURS**
Unit – I	Introduction to mushroom cultivation: General characters, systematic position, morphology, climatic needs of mushrooms – Identification of mushrooms - types of mushroom: common edible and poisonous mushroom - Mushroom training and research centers in Tamil Nadu & India	**6**
Unit – II	Mushroom shed construction - spawn preparation (grain spawn) - advantages of grain spawn - medium preparation - spawn running - storage of spawn	**6**
Unit – III	Mushroom cultivation & harvesting - button mushroom (*Agaricus bisporus)*, oyster mushroom (*Pleurotus* sajor-caju), milky mushroom (*Calocybe indica*), paddy straw mushroom (*Volvariella volvacea)* - mushrooms disease and control measures: bacterial, fungal, insect pest & nematodes diseases	**6**
Unit – IV	Post harvest operations: Harvesting – storage and preservation: freezing, drying, freeze drying and canning – spoilage of mushrooms - packing – marketing.	**6**

Unit – V	Nutrient profile of mushroom: nutritional value, medicinal value - recipes of Mushroom: Mushroom soup, sandwich, gravy, omelette, mushroom chilly, manchurian and briyani	**6**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	**9**	**3**	**1**	**3**	**1**	**3**	**3**
CLO 2	**9**	**3**	**3**	**3**	**3**	**3**	**3**
CLO 3	**9**	**3**	**9**	**9**	**9**	**3**	**3**
CLO 4	**9**	**3**	**1**	**3**	**9**	**9**	**3**
CLO 5	**9**	**3**	**9**	**3**	**1**	**9**	**3**

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CLO 1	**9**	**3**	**9**	**9**	**3**
CLO 2	**9**	**3**	**9**	**9**	**9**
CLO 3	**9**	**3**	**1**	**3**	**3**
CLO 4	**9**	**9**	**9**	**9**	**3**
CLO 5	**9**	**3**	**9**	**3**	**9**

9-Strong **3**-Medium **1**-Low

Text Books:

1. Hand book of Mushroom Cultivation-1999 - TNAU. Covai
2. Mushroom Cultivation, 2005 - Singh
3. Edible mushrooms – M. Christensen, published by uni. of Minnesota press, 2011 Ed.

Reference Books:

1. Mushroom a manual of cultivation – Biswal Subrata, PHI Learning Pvt Ltd, Delhi, 2012 Ed.
2. Mushroom Cultivation, 2005 – Suman
3. A popular guide to the identification and study of our common fungi, with special emphasis on the edible fungi. - Marshall, Nina L, garden city pub. garden city, New York, 2010 Ed.

Online Resources

1. https://www.slideshare.net/RAMESHVELCHAMY/mushroom-cultivation-238350659 (Mushroom Cultivation)
2. https://www.slideshare.net/RAMESHVELCHAMY/mushroom-diseases-amp-managements (Mushroom Diseases and Managements)

3. https://www.slideshare.net/RAMESHVELCHAMY/mushroom-training-and-research-centers-in-tamil-nadu (Mushroom Training and Research Centers In Tamil Nadu and India)
4. https://agritech.tnau.ac.in/farm_enterprises/Farm%20enterprises_%20Mushroom.html (Farm Enterprises :: Mushroom)

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT I				
1.1	Introduction to mushroom cultivation	2	Chalk & Talk	Green Board
1.2	Identification of mushrooms	2	Chalk & Talk	Green Board
1.3	Types of mushroom	2	Chalk & Talk	Green Board
UNIT II				
2.1	Mushroom shed construction	2	Chalk & Talk	Green Board
2.2	Protocol ofspawn preparation	2	PPT	LCD
2.3	Methods of spawn storage	2	Chalk & Talk	Green Board
UNIT III				
3.1	Mushroom cultivation & harvesting	2	Chalk & Talk	Green Board
3.2	Mushrooms diseases	2	Chalk & Talk	Green Board
3.3	Cultivation of milky mushroom	2	Chalk & Talk	Green Board
UNIT IV				
4.1	Post harvest operations of mushroom	2	Lecture	
4.2	Preservation techniques of mushroom	2	PPT	LCD
4.3	Mushroom marketing	2	Chalk & Talk	Green Board
UNIT V				
5.1	Nutrient profile of mushroom	2	Chalk & Talk	Green Board
5.2	Medicinal values of mushroom	2	Chalk & Talk	Green Board
5.3	Types of Mushroom recipes	2	Chalk & Talk	Green Board
	Total	**30**		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022 -2023 and after)

PART – III : Core Course Theory		SEMESTER - VI
Course Title: Plant Biotechnology		
Course Code: 08CT61	Hours per week:5	Credit:4
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To keep the students abreast of all the latest developments in Biotechnology
- To provide insights into advanced aspects of Agriculture, Environment and Medicine
- To expand the knowledge of the students in Biotechnology.

Course Outcome

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	To learn the molecular tools and vectors in genetic engineering	K1, K2 & K3
CO2	To apply fermentation techniques for industrial production of potential products	K1, K2 & K3
CO3	To remember the values of biofertilizers and nitrogen fixation	K1, K2 & K3
CO4	To analyze biogas production, waste water treatment and bioremediation	K1, K2 & K3
CO5	To gain the knowledge of gene therapy and human health care products	K1, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT	**CONTENT**	**HOURS**
Unit – I	**Tissue Culture:** Scope and history – culture technique: MS media preparation, sterilization, explant preparation and callus induction - organogenesis: somatic embryogenesis, micropropagation, artificial seed, anther and protoplast culture- germplasm conservation and cryopreservation – Intellectual Property Rights (IPR) and Protection (IPP) – Biosafety guidelines and regulations	**15**
Unit – II	**Recombinant DNA Technology:** Introduction of rDNA Technology - molecular tools: nomenclature and characteristics of Restriction Endonucleases & Ligases – Cloning vehicles: bacterial vectors (pBR322, Ti plasmid), – Brief account on strategies of gene cloning in Bacteria – Application of genetic engineering	**15**

Unit – III	**Industrial Biotechnology:** An introduction to fermentation process – Batch fermentation and continuous fermentations - Components of a typical bioreactor - Types of bioreactors - Industrial production of ethyl alcohol, and penicillin - Immobilization of enzymes and single cell proteins.	**15**
Unit – IV	**Agricultural Biotechnology:** Introduction to Biofertilizer - Types of Potential Biofertilizers (Bacteria, BGA, *Azolla* & *Mychorrhiza*) – mechanism of Nitrogen Fixation with reference to *Rhizobium* – root nodulation – nif genes – regulation of nif genes - Brief account of Biocontrol agents - *Trichoderma viridi*, *Pseudomonas fluorescence*	**15**
Unit – V	**Environmental Biotechnology:** Biological treatment of sewage: primary, secondary and tertiary treatment – Biogas: biogas plant, methanogenesis, methanogenic bacteria & application of biogas – Biofuels from algae and higher plants – Brief account on Bioremediation of contaminated soil and Phytoremediation of water	**15**

Mapping of CLO with PLO

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**
CLO 1	9	9	3	9	9	9	3
CLO 2	9	9	3	9	9	9	3
CLO 3	9	9	3	9	9	9	3
CLO 4	9	9	3	9	3	9	3
CLO 5	9	9	3	9	3	9	3

9-Strong **3-**Medium **1-**Low

Mapping of CLO with PSO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CLO 1	9	9	9	9	9
CLO 2	9	9	3	9	9
CLO 3	9	9	9	9	9
CLO 4	9	9	9	9	9
CLO 5	9	9	9	9	9

9-Strong **3-**Medium **1-**Low

Text Books:

1. Molecular Biology and Biotechnology - H.D. Humar, Vikas Publishing House, 2012
2. Advances in Biotechnology- S.N. Jogdand, Oxford University Press, 2013 Ed.
3. A text Book of Biotechnology – R.C Dubey, S.Chand & Company Ltd, Delhi, 2014

References Books:

1. Modern Biotechnology - S.B. Primrose, Black Well Scientific Publications, 2010 Ed.
2. Plant Biotechnology – PK. Gupta, Rastogi Pub, Meerut, 2012 Ed.
3. Medical Biotechnology – Nallari Pratibha, Oxford University Press, New Delhi, 2010 Ed.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_bt21/course?user_email=ramesh.vnr09@gmail.com (Industrial Boitechnology)
2. https://vlab.amrita.edu/?sub=3&brch=77&sim=694&cnt=1 (Restriction Digestion)
3. https://agritech.tnau.ac.in/farm_enterprises/Farm%20enterprises_%20biofertilizer.html (Farm Enterprises :: Biofertilizers)

Pedagogy

Chalk & Talk, PPT, Experiment & on the spot teaching

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
UNIT I				
1.1	Scope and history – culture technique: MS media preparation, sterilization, explant preparation	4	Calk & Talk	Green Board & PPT, Online Virtual Lab
1.2	callus induction - organogenesis: suspension culture, somatic embryogenesis	3	Calk & Talk	Green Board & PPT, Online Virtual Lab
1.3	Artificial seed, anther and ovule culture, protoplast culture, somatic hybridization	3	Calk & Talk	Green Board & PPT, Online Virtual Lab
1.4	Germplasm conservation and cryopreservation	2	Calk & Talk	Green Board & PPT, Online Virtual Lab
1.5	Intellectual Property Rights (IPR) and Protection (IPP) – Biosafety guidelines and regulations	3	Calk & Talk	Green Board & PPT,
UNIT II				
2.1	Introduction of rDNA Technology	3	Calk & Talk	Green Board & PPT, Online Virtual Lab
2.2	molecular tools: nomenclature and characteristics of Restriction Endonucleases (Types I-IV and subtypes of II) & Ligases –	4	Calk & Talk	Green Board & PPT, Online Virtual Lab
2.3	Cloning vehicles: bacterial vectors (pBR322, pUC19, Ti plasmid), Viral vectors - M13, Cosmid, Shuttle vector, Eukaryotic Vectors (YAC)	4	Calk & Talk	Green Board & PPT, Online Virtual Lab
2.4	Brief account on Strategies of gene cloning in Bacteria – Application of genetic engineering.	4	Calk & Talk	Green Board & PPT, Online Virtual Lab
Unit – III				
3.1	An introduction to fermentation process	3	Calk & Talk	Green Board & PPT, Online Virtual Lab
3.2	Batch fermentation vs continuous	4	Calk & Talk	Green Board & PPT,

	fermentations			Online Virtual Lab
3.3	Components of a typical bioreactor - Types of bioreactors: laboratory and production Fermenters	4	Calk & Talk	Green Board & PPT, Online Virtual Lab
3.4	Industrial production of ethyl alcohol, citric acid and penicillin - Immobilization of enzymes and single cell proteins	4	Calk & Talk	Green Board & PPT, Online Virtual Lab
Unit – IV				
4.1	Introduction to Biofertilizer	4	Calk & Talk	Green Board
4.2	Types of Potential Biofertilizers (Bacteria, BGA, *Azolla* & *Mychorrhiza*)	4	Calk & Talk	Field & Green Board
4.3	mechanism of Nitrogen Fixation with reference to *Rhizobium* – root nodulation – nif genes – regulation of Nif genes	4	Calk & Talk	Field teaching & Green Board
4.4	Brief account of Biopesticites	3	Calk & Talk	Field & Green Board
Unit – V				
5.1	Biological treatment of sewage: primary, secondary and tertiary treatment	4	Calk & Talk	Green Board & Online Virtual Lab
5.2	Biogas: biogas plant, methanogenesis: metheanogenic bacteria & application of biogas	4	Calk & Talk	Green Board, PPT & Smart class
5.3	Biofuels from algae and higher plants	3	Calk & Talk	Green Board & Online Virtual Lab
5.4	Bioremediation of contaminated soil and Phytoremediation of water	3	Calk & Talk	Green Board & Online Virtual Lab
Total		60		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Discipline Specific Elective		SEMESTER -VI
Course Title: Biodiversity Conservation and Management		
Course Code: 08EP6A	Hours per week:5	Credit:5
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To introduce the various aspects of biodiversity to the students
- To spread across the message of preventing widespread biodiversity loss.
- To highlight the uses and values of biodiversity

Course Outcome

On the successful completion of the course, students will be able

Number	**Course Outcome**	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	To understand the levels of biodiversity	K1, K2 & K3
CO2	To create awareness on the economic bowl of biodiversity resources	K1, K2 & K3
CO3	To learn the major threats of biodiversity loss	K1, K2 & K3
CO4	To gain the knowledge of biodiversity conservation strategies	K1, K2 & K3
CO5	To identify the biodiversity hotspots and the role of nodal boards	K1, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT NO	CONTENT	HOURS
Unit – I	**Preliminaries in biodiversity conservation** Definition: preservation, environmentalism, ecology and wildlife - Closer look at biodiversity - Levels of Biodiversity: Genetic (α, β and γ diversity), Species, Community and Ecosystem diversity - why biodiversity is rich in tropics? – Biodiversity at global, national (India) and local levels	**15**
Unit – II	**Economic Valuation of Biodiversity** Total economic value - use value: direct (Consumptive, productive and Non consumptive) indirect (watershed benefits, ecosystem services and evolutionary process), option values – Non use value: Existence, Altruistic & Bequest Values	**15**
Unit – III	**Loss of Biodiversity** Major causes for the loss of biodiversity: Biodiversity loss- habitat destruction and fragmentation, Over exploitation of natural resources, population explosion and hunting – Endemism and Biodiversity, listing threatened diversity: Extinct, Extinct in wild, critically endangered, Endangered, Vulnerable, Near Threatened, Least concern - Species richness and species index, and abundance	**15**
Unit – IV	**Conservation of biodiversity** Strategies followed in conservation – *In-situ* conservation: sacred groves, biosphere reserves, National parks and wild life sanctuaries. – Ex-situ conservation: cryopreservation, germplasm conservation Zoos, botanical gardens, pollen bank, gene bank, seed bank, tissue culture – ecotourism – organization involved in conservation activities: NBPGR, BSI, MoEF & NBA	**15**
Unit – V	**Conservation and management Activities** Biodiversity hot spots - red data book - Hot spots found in India – Role of IUCN, WWF and MAB programmers - biodiversity conservation of India: Environmental Protection Act – Forest conservation act & Biodiversity act.	**15**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CLO 2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CLO 3	**9**	**9**	**9**	**3**	**3**	**9**	**3**
CLO 4	**9**	**9**	**9**	**9**	**3**	**9**	**9**
CLO 5	**9**	**9**	**9**	**9**	**3**	**9**	**3**

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CLO 1	**9**	**3**	**9**	**9**	**9**
CLO 2	**9**	**3**	**3**	**9**	**9**
CLO 3	**9**	**9**	**1**	**3**	**9**
CLO 4	**9**	**9**	**3**	**9**	**3**
CLO 5	**9**	**3**	**9**	**3**	**9**

9-Strong **3**-Medium **1**-Low

Text Books:

1. Krishnamurthy. KV - An advanced Text Book on Biodiversity
2. Melchias, G.2001. Biodiversity and Conservation. Oxford and IBH publishing company Pvt, Ltd, New Delhi.
3. Kumar,- Biodiversity principles and conservation –International Book Distributors, Dehradun, 2013 Ed.

References Books:

1. E. Benson - Plant Conservation Biotechnology - Ane Books distributors, New Delhi 2013 Ed.
2. Samit Ray and Arun K. Ray - Biodiversity Biotechnology -, New Central Book Agency, Kolkata, 2010 Ed.
3. F.C.O. Osmaston - The management of Forest -, international book publishers, 2010 Ed.

ONLINE RESOURCES:

1. **https://www.e-booksdirectory.com/details.php?_(**ebook=3919**)**
2. **https://www.researchgate.net/publication/328589475 (Books_on_biodiversity_and_conservation)**
3. **https://www.researchgate.net/publication/311649188 (An_Advanced_Textbook_on_Biodiversity-_Principles_And_Practice)**
4. **https://nptel.ac.in/content/storage2/courses/120108004/module1/lecture1.pdf**
5. **http://eagri.org/eagri50/ENVS302/pdf/lec06.pdf**
6. **file:///C:/Users/BOTONY/Downloads/BIOANUAI_learning%20Resource%20Guide%20digital.pdf**

Pedagogy

Chalk & Talk, PPT, Experiment & on the spot teaching

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
UNIT I				
1.1	Definition –: preservation, environmentalism, ecology and wildlife - Closer look at biodiversity	4	Calk & Talk	Green Board & Filed

1.2	Levels of Biodiversity: Genetic (α, β and γ diversity), Species, Community and Ecosystem diversity	4	Calk & Talk	Green Board & Filed
1.3	Why biodiversity is rich in tropics?	4	Calk & Talk	Green Board & Filed
1.4	Biodiversity at global, national (India) and local levels	3	Calk & Talk	Green Board
Unit – II				
2.1	Total economic value - use value: direct	3	Calk & Talk	Green Board
2.2	Consumptive, productive and Non consumptive) indirect (watershed benefits, ecosystem services and evolutionary process)	4	Calk & Talk	Plant products , Field & Green Board
2.3	Option values – Non use value	4	Calk & Talk	Field teaching & Green Board
2.4	Existence, Altruistic & Bequest Values	4	Calk & Talk	Plant products, Field & Green Board
Unit – III				
3.1	Major causes for the loss of biodiversity: Biodiversity loss- habitat destruction and fragmentation, Over exploitation of natural resources, population explosion and hunting	3	Calk & Talk	Green Board
3.2	Endemism and Biodiversity, listing threatened diversity	4	Calk & Talk	Field & Green Board
3.3	Extinct, Extinct in wild, critically endangered, Endangered, Vulnerable, Near Threatened, Least concern	4	Calk & Talk	Field teaching & Green Board
3.4	Species richness and species index, and abundance	4	Calk & Talk	Field & Green Board
Unit – IV				
4.1	Strategies followed in conservation – *In-situ* conservation: sacred groves, biosphere reserves, National parks and wild life sanctuaries	3	Calk & Talk	Green Board & Online Virtual Lab
4.2	Ex-situ conservation: cryopreservation, germplasm conservation Zoos	4	Calk & Talk	Green Board, PPT & Smart class
4.3	Botanical gardens, pollen bank, gene bank, seed bank, tissue culture	4	Calk & Talk	Green Board & Online Virtual Lab
4.4	Ecotourism – organization involved in conservation activities: IUCN, NBPGR, BSI, MoEF & NBA	4	Calk & Talk	Green Board & Online Virtual Lab
Unit – V				
5.1	Biodiversity hot spots & red data book	3	Calk & Talk	Green Board & PPT
5.2	Hot spots found in India – Role of IUCN	3	Calk & Talk	Green Board & Smart class
5.3	WWF and MAB programmers	3	Calk & Talk	Green Board & PPT
5.4	Biodiversity conservation of India: Environmental Protection Act	3	Calk & Talk	Green Board & e-Content
5.5	Forest conservation act & Biodiversity	3	Calk & Talk	Green Board & PPT

	act			
Total		75		

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2022- 2023 and after)

PART – III : Discipline Specific Elective		SEMESTER -VI
Course Title: Botanical Entrepreneurship		
Course Code: 08EP6B	Hours per week:5	Credit:5
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To inculcate in students the dependence of man on plants.
- To provide knowledge based on various plant products.
- To establish their plant resource based business units

Course Outcome

On the successful completion of the course, students will be able to

Number	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To know the techniques of nursery establishment	

	and organic manure preparations	K1, K2 & K3
CO2	To acquire the basic concept of floriculture	K1, K2 & K3
CO3	To gain the knowledge of commercial vegetables and fruits and its preservation techniques	K1, K2 & K3
CO4	To apply the skills to prepare the value added plant products	K1, K2 & K3
CO5	To familiarize the marketing strategies to become entrepreneur	K1, K2 & K3

K1 – Knowledge **K2** – Understand **K3** – Apply

Syllabus

UNIT	CONTENT	HOURS
Unit – I	**Nursery Establishment and Management** Definition, objectives, scope and building up of infrastructure for nursery - planning and seasonal activities - Planting - direct seeding and transplants – water management - identification of deficiency symptoms - field and post harvest diseases - remedial measures and nutritional management practices – preparation and apply of farmyard and organic manure	**15**
Unit – II	**Ornamental Plants and Floriculture** Propagation of plants for beautification: Identification and salient features of some ornamental plants [Carnation, Aster, *Chrysanthemum*, *Dahlia*, Marigold, Rose, Orchids, cacti and succulents (*Opuntia*, *Agave* and Spurges)] Ornamental trees (Sarakkondrai, Kattuthimaram, fishtail palm and coral tree). Cut flowers - bonsai - Importance of flower shows and exhibitions	**15**
Unit – III	**Commercial vegetable and Fruits Management** Nutritional values and economics of vegetable and Fruits crops – spoilage – Factors influencing of spoilage – preservation techniques (physical and chemical) - Cold storage techniques - Aseptic and Packaging for transportation	**15**
Unit – IV	**Plant based products** Survey on the demand and requirement of Herbal products / formulations – cosmetics: herbal face pack, mehandi, organic hair oil and dye - Preparation of health drinks: (sukkumalli coffee & malt) Botanical recipes: jam, jelly, pickle, vaththal, fruit salat – Preparation and marketing of palm craft	**15**
Unit – V	**Entrepreneurship** Entrepreneurship opportunity, Necessity to promote Indian Traditional health Concept, Demand & opportunity for Herbal products Retailing, Marketing techniques, Sales & Promotion - Steps for starting small scale industry – schemes: NABARD, NCDC and NSIC	**15**

Mapping of CLO with PLO

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO 1	**9**	**9**	**9**	**9**	**9**	**9**	**9**

CLO 2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CLO 3	**9**	**9**	**9**	**3**	**3**	**9**	**3**
CLO 4	**9**	**9**	**9**	**3**	**3**	**9**	**9**
CLO 5	**9**	**9**	**3**	**9**	**3**	**9**	**3**

9-Strong **3**-Medium **1**-Low

Mapping of CLO with PSO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CLO 1	**9**	**3**	**9**	**9**	**9**
CLO 2	**9**	**3**	**3**	**3**	**9**
CLO 3	**9**	**9**	**1**	**3**	**9**
CLO 4	**9**	**3**	**3**	**3**	**3**
CLO 5	**9**	**3**	**9**	**3**	**9**

9-Strong **3**-Medium **1**-Low

Text Books:

1. Kumar, N. (1997) Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
2. Bose, T.K. and Som, M.G.V. (1986). Vegetable crops in India. Naya Prokash, Calcutta
3. Bose, T.K. (1985). Fruits of India tropical and subtropical. Naya Prokash, Calcutta.

Reference books

1. Thirugnanasambantham, *et al.* (2012). Introduction to Herbal Entrepreneurship, Rohini Institute of Alternative Medicine, Chennai.
2. Sundararajan, J.S. Muthuswamy, J. Shanmugavelu, K.G. Balakrishnan, R. (1995). A guide to horticulture, Thiruvenkadam Printers, Coimbatore.
3. Butts, E. and Stensson, K. (2012).Sheridan Nurseries: One hundred years of People,Plans, and Plants. Dundurn Group Ltd.

Online Resources

1. **https://www.brainkart.com/article/Entrepreneurial-Botany_38321/** **(**Botanical Entrepreneur)

Pedagogy

Chalk & Talk, PPT, Experiment & on the spot teaching

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	**Topic**	**No. of Class**	**Content Delivery method**	**Teaching Aids**
UNIT I				

1.1	Definition, objectives, scope and building up of infrastructure for nursery - planning and seasonal activities	3	Calk & Talk	Green Board & Filed
1.2	Planting: direct seeding and transplants	3	Calk & Talk	Green Board & Filed
1.3	water management - identification of deficiency symptoms	3	Calk & Talk	Green Board & Filed
1.4	Field and post harvest diseases - remedial measures and nutritional management practices	3	Calk & Talk	Green Board
1.5	preparation and apply of farmyard and organic manure	3	Calk & Talk	Green Board & Field
Unit – II				
2.1	Propagation of plants for beautification:	4	Calk & Talk	Plant material & Green Board
2.2	Identification and salient features of some ornamental plants (Carnation, Aster, Chrysanthemum, Dahlia, Marigold, Rose, Lilium, Orchids cacti and succulents (opuntia, agave and spurges)	4	Calk & Talk	Plant material, Field & Green Board
2.3	Ornamental trees (Sarakkondrai, Kattuthimaram, fishtail palm and coral tree). Cut flowers - bonsai	4	Calk & Talk	Plant material & Green Board
2.4	Importance of flower shows and exhibitions	3	Calk & Talk	Plant material, Field & Green Board
Unit – III				
3.1	Nutritional values and economics of vegetable and Fruits crops	4	Calk & Talk	Chart, Plant material & Green Board
3.2	spoilage – Factors influencing of spoilage	4	Calk & Talk	Chart, Plant material & Green Board
3.3	preservation techniques (physical and chemical)	4	Calk & Talk	Plant material & Green Board
3.4	Cold storage techniques - Aseptic and Packaging for transportation	3	Calk & Talk	Plant material & Green Board
Unit – IV				
4.1	Survey on the demand and requirement of Herbal products / formulations	4	Calk & Talk	Plant material & Green Board
4.2	cosmetics: herbal face pack, mehandi, organic hair oil and dye	4	Calk & Talk	Green Board & plant material
4.3	Preparation of health drinks: (sukkumalli coffee & malt) Botanical recipes: jam, jelly, pickle, vaththal, fruit salat	4	Calk & Talk	Green Board & plant material
4.4	Preparation and marketing of palm craft	3	Calk & Talk	Green Board & Plant material
Unit – V				
5.1	Entrepreneurship opportunity, Necessity to promote Indian Traditional health Concept,	4	Calk & Talk	Green Board

5.2	Demand & opportunity for Herbal products Retailing	4	Calk & Talk	Green Board
5.3	Marketing techniques, Sales & Promotion	3	Calk & Talk	Green Board
5.4	Steps for starting small scale industry	2	Calk & Talk	Green Board
5.5	Schemes: NABARD, NCDC and NSIC	2	Calk & Talk	Green Board
Total		75		

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)
(For those students admitted during the 2022- 2023 and after)

PART – III : Core Course Lab		SEMESTER - VI
Course Title: Taxonomy of Angiosperms, Economic Botany, Microbiology, Plant Physiology and Biotechnology		
Course Code: 08CP62	Hours per week:6	Credit:4
CIA Marks: 40	ESE Marks: 60	Total Marks: 100

Preamble

- To acquire the knowledge of angiosperm taxonomy and economic botany of given specimen
- To understand the physiology of plants
- To know the application of microorganism and biotechnology

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO 1	To identify the Angiosperm plants	K1, K2 & K3
CO2	To analyze and apply the physiological role of plants	K1, K2 & K3
CO3	To apply the skills in microbiology	K1, K2 & K3
CO 4	To gain the basic aspects of plant biotechnological techniques	K1, K2 & K3
CO 5	To remember the plant products and instruments	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT No.	CONTENT	HOURS
UNIT I	**Taxonomy of Angiosperms & Economic Botany** 1. Study of floral morphology and Identification of plants belonging to the families mentioned in the syllabus 2. Field study – plant collection – herbarium preparation – submission of 20 herbarium sheets with field report	**20**
UNIT II	**Plant Physiology** 1. Measurement of osmotic pressure by Chardakov's method 2. Determination of osmotic potential by plasmolytic method 3. Measurement of rate of Transpiration – Ganong's Potometer 4. Transpiration equal absorption 5. Effect of CO_2 concentration on Photosynthesis 6. Respiration Quotient of the given material- Ganong's Respirometer. 7. Separation of leaf pigments – Paper chromatography	**30**

UNIT III	**Microbiology** 1. Sterilization techniques and media preparation 2. Isolation of microorganisms (Bacteria only) from natural sources by serial dilution and plating methods 3. Growth curve of Bacteria 4. Staining of Bacteria – Gram staining 5. Study of Colony Characteristics of Bacteria 6. Bacterial motility-Hanging drop method 7. Antibiotic sensitivity test 8. Demonstration of agglutination reactions by means of antigen and antibody 10. Visit to microbiology divisions/Research Institute and submission of Report	**20**
UNIT IV	**Plant Biotechnology** 1. Plant tissue culture studies in medicinal plants 2. Synthetic seed production 3. Isolation of genomic DNA from plant tissues 4. Agarose gel electrophoresis 5. Isolation of Plasmid DNA 6. *Rhizobium* stain identification by immunological methods 7. Visit to tissue culture divisions/Research Institute and submission of Report	**15**
UNIT V	**Taxonomy of Angiosperms & Economic botany:** Fibres and fibre yielding plants - Spice and condiments - Resins and gums - Processing and extraction of sugar and tea **Plant Physiology:** Four leaf experiment - Foliar transpiration - Ganong's Light screen - Ganong's Respiroscope - Mohl's half-leaf experiment - Evolution O_2 during Photosynthesis - Arc Auxanometer - Clinostat - Phototropism - Kuhen's fermentation vessel - Plant growth hormones **Microbiology:** Inoculation loop - Autoclave - Inoculation chamber- Fermentor **Plant Biotechnology:** Callus - Somatic embryogenesis – Plasmid - Biogas plant - ELISA, Bioreactor	**5**

Mapping of CLO with PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	**9**	**9**	**9**	**9**	**9**	**3**	**3**
CLO2	**9**	**9**	**3**	**9**	**3**	**9**	**9**
CLO3	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CLO4	**9**	**3**	**9**	**9**	**3**	**9**	**9**
CLO5	**9**	**9**	**9**	**9**	**9**	**3**	**9**

9-Strong 3-Medium **1**-Low

CLO-PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	**9**	**3**	**9**	**9**	**9**
CLO2	**9**	**3**	**9**	**9**	**9**
CLO3	**9**	**9**	**9**	**9**	**9**
CLO4	**9**	**9**	**9**	**9**	**9**
CLO5	**9**	**9**	**9**	**9**	**9**

9-Strong; 3-Medium; 1-Low

Text Books

1. Practical Taxonomy of Angiosperms – R.K. Singha, Inter. Publishing House, Delhi, 2013 Ed
2. Economic Botany-B.P. Pandey, S.Chand & Company Ltd, Delhi, 2014 Ed.
3. Plant Physiology - Jain, V.K, S.Chand & Company Ltd, Delhi, 2013 Ed.

Reference Books

1. Morphology of Angiosperms – Eames Arthur.J, Surjeet Publications Delhi, 2014 Ed.
2. Plant Physiology - Salisbury & Ross, C.B.S Publishers, Delhi, 2013 Ed.
3. Microbiology- L.M.Prescott, J.P.Harley, D.A. Klein, McGraw Hill, Hill Education India, 2010 Ed.
4. Plant Biotechnology – PK. Gupta, Rastogi Pub, Meerut, 2012 Ed.

Online Resources

1. http://www.colby.edu/info.tech/BI211/Families.html (Taxonomy of Flowering Plants)
2. https://vlab.amrita.edu/?sub=3&brch=69 (Immunology)
3. https://vlab.amrita.edu/?sub=3&brch=73 (Microbiology)
4. https://vlab.amrita.edu/?sub=3&brch=311 (Biotechnology)

Pedagogy

Chalk & Talk, Group Discussion, Power point presentation (PPT)

Teaching Aids

Green Board, LCD Projector, Interactive White Board, Microscope, Specimen, Instrument.

Course Contents and Lecture Schedule

Module No.	CONTENT	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT I: Taxonomy of Angiosperms & Economic Botany				
1.1	Study of floral morphology and Identification of plants belonging to the families mentioned in the syllabus	15	Chalk & Talk	Green Board, Microscope, Photos, Glassware, Plants material, Instrument, Lab. Exp
1.2	Field study – plant collection – herbarium preparation – submission of 20 herbarium sheets with filed reports	**5**		
UNIT II: Plant Physiology				
2.1	Measurement of OP by Chardakov's method	5	Chalk & Talk	Green Board, Microscope, Photos, Glassware, Plants material, Instrument, Lab. Exp
2.2	Determination of osmotic potential by plasmolytic method	5		
2.3	Measurement of rate of Transpiration – Ganong's Potometer	4		
2.4	Transpiration equal absorption	4		
2.5	Effect of CO_2 concentration on Photosynthesis	4		
2.6	Respiration Quotient of the given material-Ganong's Respirometer.	4		
2.7	Separation of leaf pigments – Paper chromatography	4		
UNIT III: Microbiology				
3.1	Sterilization techniques and media preparation	2	Chalk & Talk	Green Board, Microscope, Photos, Glassware, Instrument, Lab. Exp
3.2	Isolation of microorganisms from natural sources by serial dilution and plating methods	2		
3.3	Pure culture techniques	2		
3.4	Growth curve of Bacteria	3		
3.5	Staining of Bacteria – Gram staining	2		
3.6	Study of Colony Characteristics of Bacteria	2		
3.7	Bacterial motility-Hanging drop method	2		
3.8	Antibiotic sensitivity test	3		
3.9	Demonstration of agglutination reactions by means of antigen and antibody	2		
-	Visit to microbiology divisions of an Industry			
UNIT IV: Plant Biotechnology				
4.1	Plant tissue culture studies in medicinal plants	2	Chalk & Talk	Green Board, Microscope, Photos, Glassware,
4.2	Synthetic seed production	2		
4.3	Isolation of genomic DNA from plant tissues	2		

4.4	Agarose gel electrophoresis	3		Plants material, Instrument, Lab. Exp
4.5	Isolation of Plasmid DNA	3		
4.6	*Rhizobium* stain identification by immunological methods	3		
-	Visit to tissue culture divisions of an Industry			
UNIT V: Spotters				
5.1	**Taxonomy of Angiosperms & Economic botany:** Fibres and fibre yielding plants - Spice and condiments - Resins and gums - Processing and extraction of sugar and tea	5	Chalk & Talk	Green Board, Microscope, Photos, Glassware, Plants material, Instruments, Specimens
5.2	**Plant Physiology:** Four leaf experiment - Foliar transpiration - Ganong's Light screen - Ganong's Respiroscope - Mohl's half-leaf experiment - Evolution O_2 during Photosynthesis - Arc Auxanometer - Clinostat - Phototropism - Kuhen's fermentation vessel - Plant growth hormones			
5.3	**Microbiology:** Inoculation loop - Autoclave - Inoculation chamber- Fermentor			
5.4	**Plant Biotechnology:** Callus - Somatic embryogenesis – Plasmid - Biogas plant - ELISA, Bioreactor			
TOTAL		75		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. C. SOUNDAR RAJU	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2021 -22 and after)

PART – IV : Skill Enhancement Course		SEMESTER - VI
Course Title: **Botany For Competitive Examinations**		
Course Code: 08SB61	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To explore the core concept of lower plants diversity
- To know the higher plants diversity and its economic importance
- To acquire the basic knowledge about cellular organization, physical phenomenon biomolecules and ecological principles

Course outcome (CO)

On the successful completion of the course, students will be able

CO Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO1	To recall the diversity of lower plants and their importance	K1,K2 & K3
CO2	To acquire the knowledge of seed plants and its economic values	K1,K2 & K3
CO3	To understand the physiology of plants and plant growth developments	K1,K2 & K3
CO4	To know the physiological and biochemical process of plants	K1,K2 & K3
CO5	To understand the principles of ecology	K1,K2 & K3

K1-Knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT NO	CONTENT	HOURS
Unit- I	**Plant diversity – I** Algae: range of structure, organisation, reproduction, life history and classification of algae, economic importance of algae –	**06**

	Fungi: Classification. range of structure, reproduction, life cycles, economic importance – Lichens - Bryophytes: classification, range of structure in gametophyte and sporophyte, reproduction and economic importance - Pteridophyte: classification, structure and development of gametophytes of the major groups.	
Unit- II	**Plant diversity – II & Economic Botany** Gymnosperms: classification, distribution of extinct and extant forms, comparative study of morphology, anatomy and reproductions, Economic importance – Angiosperms: morphology of the plant systems and classification-artificial system, natural system, phylogenetic system, ICBN, BSI, botanical nomenclature, herbarium techniques, critical study of important families, economic botany: food crops, cereals, millets, spices, beverage, timber yielding plant, resins, gums, tannin and rubber & fibre yielding plants.	**06**
Unit- III	**Cellular Organization** Membrane structure and function - structural organization and function of cellular organelles- organization of genes and chromosomes - cell cycle and cell division.	**06**
Unit-IV	**Plant Physiology & Biochemistry** Photosynthesis - Respiration and photorespiration- Nitrogen metabolism - Plant hormones- Sensory photobiology - Solute transport and photoassimilate translocation - Stress physiology - Chemistry and functions of carbohydrates, Lipids, Proteins, Enzymes – chemistry and biological significance of Nucleic acids.	**06**
Unit- V	**Ecological Principles** Importance of ecology, The Environment- Habitat and Niche- Species Interactions - Ecological Succession - Ecosystem Ecology, Biogeography: Age and Area Hypothesis & Wegner's theory of continental drift – Bioresources: use and management.	**06**

Mapping of CLO with PLO

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**
CLO 1	9	9	9	9	9	9	9
CLO 2	9	9	9	9	9	9	9
CLO 3	9	9	9	9	9	9	9
CLO 4	9	9	9	9	9	9	9
CLO 5	9	9	9	9	9	9	9

9-Strong **3-**Medium **1-**Low

Mapping of CLO with PSO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CLO 1	9	9	9	9	9

CLO 2	9	9	9	9	9
CLO 3	9	9	9	9	9
CLO 4	9	9	9	3	9
CLO 5	9	9	9	9	9

9-Strong **3**-Medium **1**-Low

Text Books

1. TNPSC, TRB PG Assistant Examinations Vol I & Vol II – N. Arumugam, Saras Publications, 2013 Ed.
2. Biochemistry and Molecular Biology - Buchanan B, John Wily & Sons, New Delhi, 2015 Ed.
3. Objective Botany – Ramesh Publishing House, New Delhi

Reference Books

1. CSIR-UGC NET/JRF/SET Life Sciences – Kumar pushkar, Upkar Prakashan, Agra
2. Objective Botany - Saxena NP, Krishna Prakashan Media, Meerut 2015 Ed.
3. Ecology: Global Insights and Investigations (Botany, Zoology, Ecology and Evolution) - Peter Sterling, Pearson Pub., 2nd Ed.
4. Plant Physiology and Development - Lincoln Taiz et a., Sinauer Associates, 6th Ed.

Online Resources

1. https://www.examrace.com/Sample-Objective-Questions/Botany- Questions/Botany-Mock-Test-3.html#pdfsection_7c254e96-page_10-locus_13 (MCQ Botany)
2. https://www.erforum.net/2017/01/life-science-biology-handwritten-notes-for-competitive-exams.html (Botany Notes)

Pedagogy

Chalk & Talk, PPT, Experiment & on the spot teaching

Teaching Aids

Black Board, Green Board, Chart, Specimen, Plant Material, LCD Projector, Online virtual Lab & Interactive White Board

Course Contents and Lecture Schedule

Module No.	Topic	No. of Class	Content Delivery method	Teaching Aids
UNIT - I: Plant diversity – I				
1.1	Algae: range of structure, organisation, reproduction, life history and classification of algae, economic importance of algae	2	Calk & Talk	Green Board & Filed
1.2	Fungi: Classification. range of structure, reproduction, life cycles, economic importance	1	Calk & Talk	Green Board & Filed
1.3	Lichens	1	Calk & Talk	Green Board & Filed
1.4	Bryophytes: classification, range of	1	Calk & Talk	Green Board

	structure in gametophyte and sporophyte, reproduction and economic importance			
1.5	Pteridophyte: classification, structure and development of gametophytes of the major groups.	1	Calk & Talk	Green Board & Field
Unit – II: Plant diversity – II & Economic Botany				
2.1	Gymnosperms: classification, distribution of extinct and extant forms, comparative study of morphology, anatomy and reproductions, Economic importance	2	Calk & Talk	Plant material & Green Board
2.2	Angiosperms: morphology of the plant systems and classification-artificial system, natural system, phylogenetic system, ICBN, BSI, botanical nomenclature, herbarium techniques, critical study of important families,	2	Calk & Talk	Plant material, Field & Green Board
2.3	Economic botany: food crops, cereals, millets, spices, beverage, timber yielding plant, resins, gums, tannin and rubber & fibre yielding plants	2	Calk & Talk	Plant material & Green Board
Unit – III: Cellular Organization				
3.1	Membrane structure and function	2	Calk & Talk	Chart, Plant material & Green Board
3.2	Structural organization and function of cellular organelles	2	Calk & Talk	Chart, Plant material & Green Board
3.3	. Organization of genes and chromosomes	1	Calk & Talk	Plant material & Green Board
3.4	Cell cycle and cell division	1	Calk & Talk	Plant material & Green Board
Unit – IV: Plant Physiology & Biochemistry				
4.1	Photosynthesis - Respiration and photorespiration.	2	Calk & Talk	Plant material & Green Board
4.2	Nitrogen metabolism	1	Calk & Talk	Green Board & plant material
4.3	Plant hormones- Sensory photobiology - Solute transport and photoassimilate translocation - Stress physiology	1	Calk & Talk	Green Board & plant material
4.4	Chemistry and functions of carbohydrates, Lipids, Proteins, Enzymes – chemistry and biological significance of Nucleic acids	2	Calk & Talk	Green Board & Plant material
Unit – V: Ecological Principles				
5.1	Importance of ecology, The Environment- Habitat and Niche- Species Interactions -	1	Calk & Talk	Green Board
5.2	Ecological Succession - Ecosystem Ecology,	2	Calk & Talk	Green Board

5.3	Biogeography: Age and Area Hypothesis & Wegner's theory of continental drift –.	2	Calk & Talk	Green Board
5.4	Bioresources: use and management	1	Calk & Talk	Green Board
Total		**30**		

Course Designer (Name of the Course Teacher)	**Head of the Department**
Dr. V. RAMESH	**Dr. V. RAMESH**

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2021- 2022 and after)

PART – IV : Skill Enhancement Course		
Subject Title: **Remote Sensing and GIS**		
Subject Code: 08SB62	Hours per week: 2	Credit**:** 2
CIA Marks: 25	Summative Marks: 75	Total Marks: **100**

Preamble

- To know the instruments employed in remote sensing
- To study the satellite data products; forest mapping
- To know the importance of remote sensing in forest management.

<u>Course outcome (CO)</u>

- On the successful completion of the course, students will be able

CO Number	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO1	To acquire the basics of Remote sensing	K1, K2 & K3
CO2	To learn the skills on remote sensing instruments	K1, K2 & K3
CO3	To understand the applications remote sensing in various field	K1, K2 & K3
CO4	To know the core concept of geographical information system	K1, K2 & K3
CO5	To understand the application of GIS	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

Syllabus

UNIT NO	CONTENT	HOURS
UNIT I:	**Introduction to Remote Sensing** Definition of Remote sensing, Physical basis- basic wave theory and quantum theory, Electromagnetic spectrum, and its usage in remote sensing, Interactions with atmosphere – scattering and absorption.	**6**
UNIT II:	**Remote sensing instruments** Introduction to Sensors, Classification of sensors, Active and Passive instruments, Derivation of Information-Remotely sensed data and its different type. Platforms and its various types.	**6**
UNIT III:	**Remote Sensing Applications** Thematic Map, Thematic applications, Integrated applications, NRSA and NNRMS, IRS and future mission.	**6**
UNIT IV:	**Geographical information system** Introduction, Definition, Components of GIS – Hardware, Software, Data, People and methods	**6**
UNIT V	**GIS Application**: Introduction, Problem identification, Designing a model, Project Management and implementation.	**6**

Mapping of CLO with PLO

	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO7

CLO 1	9	9	3	3	3	3	3
CLO 2	3	3	3	3	3	3	3
CLO 3	3	9	3	3	3	3	3
CLO 4	3	9	3	3	3	9	9
CLO 5	3	3	3	3	3	9	9

9-Strong; 3-Medium; 1-Low

Mapping of CO with PSO

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CLO1	9	3	3	9	9
CLO2	3	3	3	9	9
CLO3	3	3	3	9	9
CLO4	3	3	3	9	9
CLO5	3	3	3	9	9

9-Strong**; 3**-Medium**; 1**-Low

Pedagogy

Chalk & Talk, Group Discussion, PPT

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Text Books:

1. Basics of RS & GIS. S. Kumar University science press, New Delhi, 2012
2. RS & GIS. B. Bhatta, Oxford University Press, 2010.
3. Applications of Remote Sensing & GIS - Rajeev Sharma, 2005

Reference Books:

1. Principles of remote sensing an introductory textbook –Wim H. Bakker et al., the inter institute of aerospace survey and earth sciences, Netherlands 2010 Ed.
2. Remote sensing and image interpretation. Lilles and Kiefer, Chipman, wily India – New Delhi – 2012.
3. Physical basis of RS - George Joseph, 2005

Online Resources:

1. https://www.slideshare.net/amalmurali47/seminar-28925946 (Remote sensing)
2. https://www.slideshare.net/Dhwani7887/remote-sensing-66205597 (Remote sensing-Basic techniques)
3. https://www.slideshare.net/MohitGoyal1/remote-sensing-75532608 (Remote sensing instruments and EM)
4. https://www.slideshare.net/anurag170494/application-of-remote-sensing (Remote sensing applications)

5. https://sjce.ac.in/wp-content/uploads/2018/01/REMOTE-SENSING-AND-GIS-PPT.pdf (Geographical Information System)
6. https://www.slideshare.net/arniontech/gis-presentation-13885167 (GIS)
7. https://www.slideshare.net/FayazAhamedAP/application-of-gis-geographical-information-system (GIS applications)

Course Content and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
	Unit -1			
1.0	Definition of Remote sensing	1	Discussion	Green Board
1.1	Physical basis- basic wave theory and quantum theory	1	Lecture	Green Board
1.2	Electromagnetic spectrum, and its usage in remote sensing,	2	Discuss	Green Board
	Interactions with atmosphere – scattering and absorption.	2	Chalk & Talk	Green Board
	Unit -2			
2.0	**Remote sensing instruments:** Introduction to Sensors, Classification of sensors,	2	Lecture	Green Board
2.1	Active and Passive instruments.	2	Chalk & Talk	Green Board
2.2	Derivation of Information-Remotely sensed data and its different type. Platforms and its various types	2	Chalk & Talk	Green Board
	Unit -3			
3.0	**Remote Sensing Applications** Thematic Map, Thematic applications,.	3	Chalk & Talk	Green Board
3.1	Integrated applications, NRSA and NNRMS, IRS and future mission	3	Discussion	Green Board
	Unit -4			
4.0	**Geographical information system:** Introduction, Definition, Components of GIS –	3	Discussion	Green Board
4.1	Hardware, Software, Data, People and methods	3	Chalk & Talk	Green Board
	Unit -5			
5.0	**GIS Application**: Introduction, Problem identification,	3	Lecture	Green Board
5.1	Designing a model, Project Management and implementation.	3	Chalk & Talk	Green Board
	Total	**30**		

Course Designer (Name of the Course Teacher)	Head of the Department
Dr. T. SELLATHURAI	Dr. V. RAMESH

DEPARTMENT OF BOTANY

Programme: B.Sc. BOTANY (CBCS and LOCF)

(For those students admitted during the 2021- 2022 and after)

PART – IV : Skill Enhancement Course		SEMESTER - VI
Course Title: Nanobiology		
Course Code: 08SB63	Hours per week:2	Credit:2
CIA Marks: 25	ESE Marks: 75	Total Marks: 100

Preamble

- To acquire knowledge in Nanobiology
- To obtain various skills in nanotechnology
- To learn the newer technologies for competency.

Course outcome (CO)

On the successful completion of the course, students will be able

CO Number	**Course Outcome**	**Knowledge Level (according to Bloom's Taxonomy)**
CO1	To acquire the knowledge of Nanotechnology	K1, K2 & K3
CO2	To familiarize the component of nanomaterial	K1, K2 & K3
CO3	To gain the basic knowledge of biosensors	K1, K2 & K3
CO4	To understand the application of nanomaterial in diagnostics	K1, K2 & K3
CO5	To understand the application of nanotechnology in agriculture	K1, K2 & K3

K1-knowledge **K2-Understand** **K3-Apply**

- **Syllabus**

UNIT NO	**CONTENT**	**HOURS**
Unit- I	**Unit I: Nanotechnology** Introduction, definition of nanoobjects – Types- non-intentionally-made nanomaterials Intentionally-made nanomaterials, Nanotechnology Products - Top-Down and Bottom-UP, Classification of nanomaterials - Zero-dimensional (OD), One-dimensional (1D), Two-dimensional (2D), Three-	**6**

	dimensional (3D), basic principles of nanotechnology – areas of applications.	
Unit- II	**Unit II: Cellular Machines** Nanomaterial's (Nano- tubes, Nano-wires, Nano- crystals, Nano-particles – Quantum dots, Biomacromolecules (DNA and Protein structure).	**6**
Unit- III	**Unit III: Biosensors** Enzymes and protein based sensing – DNA amplification, DNA Probes and assays – Liposomes, Fluidics, Biomembranes and Biochips.	**6**
Unit-IV	**Unit IV: Nanomedicine** Importance in diagnostics – Biocompatibility – diseases and Therapeutics.	**6**
Unit- V	**Unit V: Nanotechnology and Agriculture** Nano Agricultural Mechanization – Genetically Modified Organism's – Agricultural Engineering – Need for Nanoagriculture	**6**

- **Mapping of CLO with PLO**

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO5**	**PLO 6**	**PLO7**
CLO 1	9	9	3	3	1	3	3
CLO 2	3	9	1	3	1	3	9
CLO 3	9	3	9	3	1	3	9
CLO 4	3	9	3	3	1	3	9
CLO 5	9	9	9	9	9	9	9

- **9-Strong; 3-Medium; 1-Low**

Mapping of CLO with PSO

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CLO1	9	9	9	9	9
CLO2	3	3	3	3	3
CLO3	9	9	9	9	9
CLO4	3	3	3	9	9
CLO5	9	9	9	9	9

9-Strong**; 3**-Medium**; 1**-Low

Text Books:

1. Nano Biotechnology – Subbiah Balagi, MZP Publishers, 2010 Ed.
2. Nano Science & Nanotechnology – KK. Chatiopadhyay, PHI Learning, New Delhi, 2012 Ed.
3. Bio Nanotechnology – Vinita Singh, Advanced Learners Press, New Delhi, 2013 Ed.

Reference Books:

1. Elements of Nanotechnology – KK. Sulabha, IBD Pub. New Delhi, 2010 Ed.
2. Bioinformatics – Methods & Protocols – Misener, IBD Pub. New Delhi, 2013 Ed.
3. Nanotechnology – U. Kumar, Agrobios. India, 2013 Ed.

Online Resources

1. **https://www.azonano.com/article.aspx?ArticleID=1134 (Nanotechnology)**
2. **https://ec.europa.eu/health/scientific_committees/opinions_layman/nanomaterials/en/index.htm** (Nanomaterials**)**
3. **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934206/** **(**Enzymes and protein based sensing**)**
4. **https://www.frontiersin.org/articles/10.3389/fchem.2018.00360/full (Nanomedicine)**
5. **https://www.researchgate.net/publication/325827657_Application_of_Nanotechnology_in Agriculture and_Food_Production_-_Nanofood_and_Nanoagriculture** **(**Nanoagriculture**)**

Pedagogy

Chalk & Talk, Group Discussion, PPT

Teaching Aids

Green Board, LCD Projector, Interactive White Board

Course Content and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
	Unit -1			
1.0	**Nanotechnology** Introduction, definition of nano objects –	1	Discussion	Green Board
1.1	Types- non-intentionally-made nonmaterial's Intentionally-made nanomaterials,	2	Lecture	Green Board
1.2	Nanotechnology Products - Top-Down and Bottom-UP,	2	Discuss	Green Board
	Classification of nanomaterials - Zero-dimensional (OD), One-dimensional (1D), Two-dimensional (2D), Three-dimensional (3D), basic principles of nanotechnology – areas of applications.	1	Chalk & Talk	Green Board

2.0	**Cellular Machines** Nanomaterial's (Nano- tubes, Nano-wires, Nano- crystals, Nano- particles – Quantum dots,	3	Lecture	Green Board
2.1	Biomacromolecules (DNA and Protein structure).	3	Chalk & Talk	Green Board
3.0	**Biosensors** Enzymes and protein based sensing – DNA amplification,	3	Chalk & Talk	Green Board
3.1	DNA prLOCFs and assays – Liposomes, Fluidics, Biomembranes and Biochips.	3	Discussion	Green Board
4.0	**Nanomedicine** Importance in diagnostics –	3	Discussion	Green Board
4.1	Biocompatibility – diseases and Therapeutics.	3	Chalk & Talk	Green Board
5.1	Nano Agricultural Mechanization – Genetically Modified Organism's –	3	Chalk & Talk	Green Board
5.2	Agricultural Engineering – Need for Nanoagriculture	3	Chalk & Talk	Green Board
	Total	**60**		

Course Designer **(Name of the Course Teacher)**	**Head of the Department**
Dr. T. SELLATHURAI	**Dr. V. RAMESH**

PART – IV : Common Subject Theory		
Subject Title **: Value Education**		
Subject Code: **VEUG61**	Hours per week: **2**	Credit: **2**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

UNIT I: The heart of Education

Introduction – Eternal Value – Integrated approach to value education - one for all and all for one – Responsibilities of a citizen – Habit Vs wisdom – purifying mind pollution – Respect for all Religions – Parents, teachers and fellow students – The need and benefit of exercise and meditation for students.

UNIT II: The Value of Body and Life Energy

Introduction – what are the causes for paid, Disease and death? Three Basic needs for all living Beings – Personal Hygeine Five Factors of Balance in Life – The need and benefits of physical Exercise – The value and Base of Life energy – The value and Base of Bio-magnetism - You are your own best caretaker.

The Marvelous nature of mind

Introduction- Bio-magnetism – The base of the mind – characterisation of the Genetic Centre – metal frequency – practice for a creative mind - benefits of meditation.

UNIT III: Analysis of Thought

Introduction – An Explosion on the nature of thought– six roots for thoughts – Introspection for analysis of thoughts-practical techniques for analysis of thoughts. Benefits of Blessings Effects of good vibrations – Make Blessing a Daily Habit

UNIT IV: Moralisation of Derive

Introduction – moralization of desire - Analyse your desires – Summary of practice.

Neutralision of Anger:
Introduction – meaning – characteristics of Anger – Anger is a Destructive emotion – Anger spoils our relationship with others – Some common misconception about anger

– will power and method success through awareness – method of neutralisation of anger.

UNIT V: Eradication of Worries

Worry is a mental disease – Nature's Law of cause and effect – factors beyond our control – How to deal with problems – analyse your problem and eradicate worry

Harmonious Relationships

Introduction – Three angles of life – The value of harmony in personal relations – Love and Compassion – pleasant face and loving words – appreciation and gratitude to parents and teachers – Bringing needed reforms in educational institutions – Why should we serve others? Brotherhood – A scientific Basis for Universal Brotherhood protection of the environment – non-violence and the five fold moral culture.

Text Book: Value Education for Health, Happiness and Harmony
(Based on the Philosophy and Teachings of Swami Vethanthiri Maharisi)

PART – V : Common Subject Theory		
Subject Title **: Extension Activities**		
Subject Code: **EAUG61**	Hours per week:	Credit: **1**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

UNIT-I: Community Development-I

Definition – structure and composition – community based issues – need for awareness – Developmental Programmes.

UNIT – II: Community Development–II

Rural Scenario – need of the Community – need for the community service – role of youth in community building – communal harmony – literacy – Educational Recreation.

UNIT – III: Volunteer Empowerment

Women's Emancipation – formation of Youth Clubs – Self-Help Groups – Youth and Development.

UNIT – IV: Social Analysis

Social issues – cultural invasion – media infiltration – human rights Education/Consumer Awareness – Adolescents Reproductive – HIV/AIDS/STD – Social harmony/National integration – Blood Donation.

UNIT – V: Introduction to NSS

Basic Concepts – profile – aims – objectives – symbol – Motto – structure – Regular activities – Special Camping Programme – Adventure Programme – National Days and Celebrations.(Applicable to NSS Students)

(OR)

NCC - Origin – Organisation – Ministry of Defence – Armed forces – commands – Defence establishments in Tamil Nadu Civil Defence – Aid to civil authorities – Disaster management – Leadership – Man management – Adventure activities – Social service

Reference: National Service Scheme Manual (Revised), Ministry of Human Resources Development, government of India.

CERTIFICATE COURSE IN MEDICINAL BOTANY

UNIT: I

Pharmocognosy – definition, Scope, History, Indigenous system of medicine (Ayurveda, Unani & Siddha) – Classification of crude drugs (Alphabedical, Taxnomical, morphological, Pharmacological, chemical and Chetexonomical)

UNIT: II

Collection and processing of crude drugs- harvesting, drying, garbling, packing and storage of crude drugs, Drugs adulteration- types of adulterants –methods of drug evaluation (Physical, chemical, biological and organoleptic) Evaluation and Pharmacopoeia standards.

UNIT: III

Products derived from plants (Secondary metabolites) pharmaceutically important products, their classification, properties, isolation and medicinal uses of the following Alkaloids, Tannins, Phenols, Resins and gums

UNIT: IV

Botanical names, common and vernacular names, morphology of the useful parts and medicinal uses of the following:

Stem & Tuber	- *Zingiber officinale*
Bark & wood	- *Cinnamomum verum,*
	Santalum album
Leaves	- *Cassia alexandrina*
Buds & flowers	- *Syzygium aromaticum*
Fruits	- *Aegle marmelos*
Seeds	- *Myristica fragrans*
Resins and Gums	- *Ferula asa-foetida*

UNIT: V

Botanical name, common name, family, chemical constituents, cultivation, processing, harvesting and uses of the following *Withania somnfiera, Aloe vera, Emblica offcinalis and Carthamus tinctorius*

Text Books

1. Medicinal plants of India –SS. Lal, New central book Agency, Delhi, 2012 Ed.
2. Herbs Cultivation and medicinal uses – H.Panda, NIIR Publication, New Delhi, 2010 Ed.
3. Economic Botany-s.L.kochar, MacMillan Inmdian Ltd, New Delhi, 2012 Ed.

Reference Books

1. Economic Botany-F.Hill, Tata Mcgraw HillPublishing.com, New Delhi, 2014 Ed.
2. Medicinal plants-Anil Kumar, Inter.sci. Publishing academy, New Delhi, 2014 Ed.
3. Economic Botany-Albert F.Hill surjeet Publications, Delhi, 2012 Ed.

Online Resources

1. **https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/secondary-metabolite (Secondary metabolites)**
2. https://www.sciencedirect.com/science/article/abs/pii/s0273230012000633 **(**guidelines and Pharmacopoeial standards for pharmaceutical impurities: overview and critical assessment**)**
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3459456/(Ferula *asafoetida*: Traditional uses and pharmacological activity)

CERTIFICATE COURSE IN HORTICULTURE

UNIT: I

Introduction to Horticulture - types of gardening-indoor, public and dam gardens

UNIT: II

Propagation techniques –methods of cutting, layering, grafting and budding

UNIT: III

Cutting practices: Transplanting methods (bare rooted, shifting and balling, burlapping, potting and reporting) irrigation and manuring

UNIT: IV

Horticulture techniques: disbudding, ringing, notching, smudging and pruning

UNIT: V

Kitchen gardening-layout and maintenance, indoor gardening, rockery, Bonsai and lawn

Text books

1. Horticulture – V.L.Sheela, MJ Publishers, 2013 Ed.
2. Horticulture at a glance Amar singh, kalyani Pub, Chennai, 2013 Ed.
3. A manual of Gardening - Arun Zingare, satyam Pub, Jaipur, 2013 Ed.

Reference Books

1. Hand Book of Horticulture- K.L.Chadde, D.I.and Pub, Agri, New Delhi, 2012 Ed.
2. Principles of Horticulture- S.Prasad, Agrobios, International Books, 2013 Ed.

3. A manual of Gardening - Arun Zingare, satyam Pub, Jaipur, 2013 Ed.

Online Resources

1. **http://agrimoon.com/fundamentals-of-horticultur-pdf-book/**
2. **https://www.iaritoppers.com/p/horticulture-icar-ecourse-pdf-books.html**
3. **http://agrimoon.com/horticulture-icar-ecourse-pdf-books/**