KAMARAJ COLLEGE
(AUTONOMOUS)
Accredited with A+ Grade by NAAC
Among Top 150 Colleges in India - NIRF Ranking 2024
இந்து நாடார் சங்கங்களால் 1966-ல் தொடங்கப்பட்ட கல்லூரி
(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)
THOOTHUKUDI - 628 003.

B.Sc., Botany

Semester - III

SYLLABUS

(With effect from the academic year 2024-2025 onwards)

Department Profile

Name of the Programme : B.Sc., Botany

Programme Code : 03009

Year of Establishment : 1985-86

Vision

To prepare students for lifelong learning by introducing them to the vast world of plant knowledge and the methodology of academic inquiry.

Mission

To impart knowledge of science, develop a scientific attitude, and make students aware of the importance of the environment and natural resources

College Mail ID : **kamarajcoll@gmail.com**

College Website : **https://kamarajcollege.ac.in/**

Undergraduate Degree Programme

1. Introduction

Programme Outcome, Programme Specific Outcomes and Course Outcomes Students completing this programme will be able to present their core under-graduate discipline clearly and precisely, make abstract ideas precise by formulating them in the language of the specific discipline, describe related ideas from multiple perspectives and explain fundamental concepts. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in various other public and private enterprises.

Eligibility:

A pass in Higher Secondary examinations or its equivalent in Science stream with Biology/ Botany/Zoology/Microbiology as one of the course or a course from general stream course (Biotechnology, Biochemistry, and Microbiology) is eligible to apply.

Learning Outcomes-Based Curriculum Framework Guidelines Based Regulations For Under Graduate Programme	
Programme:	B.Sc. (Botany)
Programme Code:	03009
Duration:	3 Years (UG)
Programme Outcomes:	
PO1	**Disciplinary knowledge**: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.
PO2	**Communication Skills**: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3	**Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO4	**Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
PO5	**Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
PO6:	**Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7:	**Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
PO8:	**Scientific reasoning:** Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes	
On successful completion of Bachelor of(chemistry) programme, the student should be able to:	
PSO1:	**Disciplinary Knowledge**:
PSO2:	**Critical Thinking:**
PSO3:	**Problem Solving**
PSO4:	**Analytical & Scientific Reasoning**:
PSO5:	**Research related skills:**

Methods of Evaluation		**Marks**	
Internal Evaluation	Continuous Internal Assessment Test	15	25
	Assignment (PPT) and Seminar	5	
	Group Discussion and Viva	5	
External Evaluation	End Semester Examination		75
Total			**100**
Methods of Assessment			
Recall (K1)	Simple definitions , MCQ, Recall steps, Concept definitions		
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or Overview		
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain		
Analyze (K4)	Problem solving questions, Finish a procedure in many steps, Differentiate Between various ideas, Map knowledge		
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons		

Extra Credits

Curricular Activities	**Co-Curricular Activities**	**Extra-Curricular Activities**
Paper Presentation	Cultural Competitions	NCC
Paper Publication	Domain Clubs	NSS
Placement Training		Sports
Quiz		YRC
Competitions		UBA
SWAYAM /NPTEL/MOOCs		

Level	**Credit**			
	Participation	**III Prize**	**II Prize**	**I Prize**
Intra college	1	2	3	4
Intercollegiate	2	3	4	5
District	3	4	5	6
University	4	5	6	7
State	5	6	7	8
National	6	7	8	9
International	7	8	9	10

****Paper Presentation for each paper: 1 credit.**

Total credits Under – Graduate Courses including Lab Hours- 2024 to 2025

Semester	Hours	Credits	Additional Credits	Extra Credits
I	30	22	2	
II	30	22	2	
III	30	22	2	
IV	30	23	2	
V	30	28	2	
VI	30	23	2	
Total		**140**	**14**	

**Extra Credit will be given on the basis of student's performances

Written Examination: Theory Paper (Bloom's Taxonomy based) Question paper Model

Assessment Pattern

Continuous Internal Assessment (CIA) & End Semester Examination (ESE)

- CIA : 25
- ESE: 75

Theory Course:

For theory courses there shall be two tests conducted by the faculty concerned and the average can be taken as the Continuous Internal Assessment (CIA).CIA is for 30 marks max and will be converted in to 15 marks. The duration of each test shall be 1.15 Hrs.

Continuous Internal Assessment (Writing)	15 marks
Assignment (PPT) & Seminar	5 marks
Group Discussion & Viva	5 marks

For theory Papers:

- Part A (10 × 1 = 10) Marks-Answer all questions(Multiple choice)
- Part B (5 × 5 = 25) Marks-Choosing either (a) or (b)
- Part C (5 × 8 = 40) Marks-Choosing either (a) or (b)
- **Total =75 marks**

Laboratory Courses Assessment

- CIA - 40 marks
- ESE -60 marks
- Mandatory Record submission, attendance and class participation.
  - Experiments (a minimum of six experiments) done in the class alone should be recorded.
  - Students having a bonafide record only should be permitted to appear for the practical examination.
  - Experimental work - 20 marks
  - Regularity -20 marks

In order to avoid pull the score down of each PO, it is suggested that the usage L-Low (1) to the minimum.

The S, M, L is based on the Course outcomes. The mapping is

based on the revised Bloom's Taxonomy Verbs used to describe

your Course outcomes.

- Remember and Understanding – Lower level
- Apply and Analyse – Medium Level
- Evaluate and Create – Strong Level

Pedagogy:

- Technology Based Learning (PPT)
- Peer Teaching (Chalk & Talk)
- Virtual Lab
- Blended Learning (Online & Offline)
- Group Learning
- Self - Study
- Games Based Learning

Course Structure for Science Stream

(With effect from the academic year 2024 to 2025 onwards)

Second Year – Semester III

UG Botany

Semester III	Course Code	Title of the Course	Hours / Week	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part- I	24ULTL31	பொதுத்தமிழ்: தமிழக வரலாறும் பண்பாடும்	**6**	**4**	**3**	**25**	**75**	**100**
Part- II	24ULEN31	General English - III	**6**	**4**	**3**	**25**	**75**	**100**
Part -III Core- V	24UMBO31	Plant Diversity III -	**5**	**4**	**3**	**25**	**75**	**100**
Core VI Lab - III	24UECH31	Plant Diversity III Practical-III	**3**	**2**	**3**	**50**	**50**	**100**
EC -III Discipline /Generic	24UECH31	Part -III - Allied: Chemistry Paper – I	**4**	**3**	**3**	**25**	**75**	**100**
	24UECHL3	Allied Practical	**2**	**2**	**3**	**50**	**50**	**100**
Part-IV SEC- IV	**24USBO31** 24USBO32 24USBO33	1. **Cell & Molecular Biology** 2. Herbal Technology 3. Silviculture and Agroforestry	**2**	**2**	**3**	**25**	**75**	**100**
Part - IV	Yoga, Culture & Heritage		**2**	**2**	**3**	**25**	**75**	**100**
	Total		**30**	**23**				

**** SEC-Skill Enhancement Course** ****CIA- Continuous Internal Assessment**

****EC –Elective Course** **** ESE- End Semester Examination**

Plant Diversity III

Bryophytes and Pteridophytes

<table>
<tr><td>Title of the Course</td><td colspan="7">Plant Diversity III</td></tr>
<tr><td>Course Type</td><td colspan="7">Core III</td></tr>
<tr><td>Year</td><td>II</td><td>Semester</td><td>III</td><td>Credits</td><td>4</td><td>Course Code</td><td>24UMBO31</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>3</td><td colspan="2">2</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Students should be familiar with the basics of Bryophytes and Pteridophytes.</td></tr>
<tr><td colspan="8">Learning Objectives</td></tr>
<tr><td>LO 1</td><td colspan="7">To enable the students to have an overview of General characters classification and economic importance of Bryophytes</td></tr>
<tr><td>LO 2</td><td colspan="7">To understand the morphological diversity, structure and reproduction of Bryophytes.</td></tr>
<tr><td>LO 3</td><td colspan="7">To know the General characters and classification of Pteridophytes</td></tr>
<tr><td>LO 4</td><td colspan="7">To understand the morphological diversity, structure and reproduction of Pteridophytes.</td></tr>
<tr><td>LO 5</td><td colspan="7">To gain knowledge on the economic uses of Pteridophytes</td></tr>
</table>

Unit	Contents
I	General characters of Bryophytes, classification (Rothmaler 1951. Upto the order level) .Economic importance of Bryophytes – Ecological importance (Pollution Indicators and monitoring), Medicinal uses, horticulture, industrial uses and absorbent bandages.
II	Structure, reproduction and life histories of the following classes each with a suitable example: Hepaticopsida (Marchantia); Anthoceratopsida (Anthoceros) and Bryopsida (Polytrichum).
III	Pteridophytes General Characters of Pteridophytes - Classification (Sporne, 1951).Apogamy and apospory, homospory and heterospory**.**
IV	Morphology, anatomy and reproduction of the forms belonging to the following classes: Psilotopsida (Psilotum), Lycopsida (Selaginella),
V	Morphology, anatomy and reproduction of the forms belonging to the class Pteropsida (Marsilea). Economic importance of Pteridophytes- Medicinal uses, horticulture, industrial and ecological uses.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts:	
1	Sharma, O.P.2017. Bryophyta, Mac Millan India Ltd. Delhi.
2	Alam, A. 2020. Contemporary Research on Bryophytes Book Series: Recent Advances in Botanical Science. 10.2174/97898114337881200101.
3	Alain Vanderpoorten. 2009. Introduction to Bryophytes, 1st Edition, Cambridge University Press.
4	Chopra, R. N. 2005. Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.
5	Prem Puri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram & Sons. Lucknow, India.
References Books:	
1	Eames, A. 1963. Morphology of lower vascular plant, McGraw Hill, Chennai.
2	Parihar. N.S. 1967. An introduction of Embryophyta, Vol.III – Pteriodophyta, Central book depot, Allahabad.
3	Smith, G.M. 1955. Cryptogamic Botany, Volume-II– McGraw Hill, Chennai
4	Sporne, K.L. 1976. Morphology of Pteridophytes, 4th edition, B.I. Publication. Chennai.
5	Watson, E.V.1963. The structure and Life of Bryophytes. Hutchinson & Co, UK.
Web Resources:	
1	http://www.bryoecol.mtu.edu/
2	https://www.amazon.in/IntroductionBryophytes-Alain-Vanderpoorten-ebook/dp/B007NWFWQK
3	http://www.bsienvis.nic.in/Database/Pteridophytes-in-India_23432.aspx
4	http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm
5	http://www.botany.ubc.ca/bryophyte/mossintro.html aeTIUC&redir_esc=y

Course outcomes CO	On completion of this course, students will be able to
CO1	Recognize morphological variations and uses of Bryophytes
CO2	Explain the anatomy and reproduction of Bryophytes belonging to different classes
CO3	Identify the distinguishing features of Pteridophytes
CO4	Compare and contrast the variations in the internal cellular organization, gametophyte and sporophyte of Pteridophytes
CO5	Access the useful role Pteridophytes

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Plant Diversity III

<table>
<tr><td>Title of the Course</td><td colspan="7">Plant Diversity III</td></tr>
<tr><td>Course Type</td><td colspan="7">Core-Major Practical's-III</td></tr>
<tr><td>Year</td><td>II</td><td>Semester</td><td>II</td><td>Credits</td><td>2</td><td>Course Code</td><td>24UMBOL3</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">-</td><td colspan="2">--</td><td>3</td><td>3</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Students should be familiar with the basics of Bryophytes and Pteridophytes</td></tr>
<tr><td colspan="8">Learning Objectives</td></tr>
<tr><td>LO 1</td><td colspan="7">To enable students to learn the skill of hand sectioning.</td></tr>
<tr><td>LO 2</td><td colspan="7">To study diversity of morphological diversity, structure and reproduction of Bryophytes..</td></tr>
<tr><td>LO 3</td><td colspan="7">To understand the morphological diversity, anatomical structure and reproduction Pteridophytes</td></tr>
<tr><td>LO 4</td><td colspan="7">To Develop skills in micro preparation of reproductive structures of Bryophytes and Pteridophytes</td></tr>
<tr><td>LO 5</td><td colspan="7">To identify Bryophytes and Pteridophytes in natural habitats.</td></tr>
</table>

Practical

Bryophytes

1. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Bryophytes genera included in the theory syllabus.

Pteridophytes

1. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Pteridophytes genera included in the theory syllabus.

2. Botanical excursion- Field Study & Submission of report

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. Sharma, O.P.2017. Bryophyta,MacMillanIndia Ltd,NewDelhi. 2. Sharma, O.P.2012. Pteridophyta,Tata McGraw-Hills Ltd,NewDelhi. 3 .Ashok, M. Bendre and Kumar. 2010. A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany. Revised edition. Published by Rakesh Kumar Rastogi publication. 4. Prem Puri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram & Sons. Lucknow, India. 5. Tuba Z., Slack N.G. and Stark L.R. 2011. Bryophyte Ecology and Climate Change. Cambridge university press, Cambridge.
Reference Books	1. Ashok, M. Bendre and Kumar. 2010. A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany. Revised edition. Published by Rakesh Kumar Rastogi publication. 2. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing. 3. Puri, P. 1980. Bryophytes. Atma Ram and Sons, New Delhi. 4. Sporne, K.R. 1991. The Morphology of Pteridophytes. B.I. Publ. Pvt. Ltd. Chennai. 5. Vashista.P.C. 1971. Botany for Degree students: Pteridophyta. S.Chand & Co. New Delhi.
Web sources	1. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh- Kumar/dp/B0072GNFX4 2. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan- Sundara/dp/8126106883 3. http://www.eeb.uconn.edu/people/goffinet/Classification mosses.html 4. https://www.vitalsource.com/products/introduction-to-bryophytes-alain- vanderpoorten-v9780511738951?duration=perpetual 5. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/

Course outcomes: CO	On completion of this course, the students will be able to
CO1	Recognize the major groups of Non-vascular and Vascular Cryptogams.
CO2	Describe the structure of Bryophytes and Pteridophytes forms prescribed in the syllabus.
CO3	Identify and illustrate the morphological and anatomical features of bryophytes and Pteridophytes.
CO4	Develop comprehensive skills in sectioning and micro Preparation.
CO5	Interpret the significance of reproductive structures in Bryophytes and Pteridophytes.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3

Cell and Molecular Biology

Title of the Course		**Cell and Molecular Biology**					
Course Type		**Skill Enhancement Course**					
Year	**II**	**Semester**	**III**	**Credits**	**2**	**Course Code**	**24USBO31**
Instructional Hours per week		**Lecture**		**Tutorial**		**Lab Practice**	**Total**
		2				**--**	**2**
Pre-requisite		**To understand the Cell structure and functions.**					

Learning Objectives	
LO 1	To understand the structure and function of eukaryotic and prokaryotic cells.
LO 2	To know molecular mechanisms of gene expression, regulation, and protein synthesis.
LO 3	To Understand the molecular details of cell division, signalling, and metabolism.
LO 4	To Analyze experimental data related to molecular and cellular processes.
LO 5	To know techniques such as PCR, gel electrophoresis

Unit	Contents
I	Ultra structure of Prokaryotic cell and Eukaryotic cell. Plasma membrane -structure (fluid mosaic model) and function. Cell cycle, Cell division, Mitosis and their significance.
II	Structure and function of Endoplasmic reticulum, Ribosomes, Mitochondria, Chloroplast.
III	**Molecular Basis of Inheritance**- Structure of DNA and RNA. DNA replication and repair mechanisms. Transcription and translation.
IV	**Cellular Metabolism**: Outline of cellular respiration: Glycolysis, Citric Acid Cycle, Oxidative Phosphorylation. Photosynthesis: Light and dark reactions.
V	**Molecular Techniques in Biology :** Introduction to recombinant DNA technology. Applications of molecular techniques in medicine and biotechnology . Ethical issues in genetic engineering.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts:	

1	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). Molecular Biology of the Cell (6th Edition). Garland Science
2	Lodish, H., Berk, A., Zipursky, S. L., et al. (2016). Molecular Cell Biology (8th Edition). W. H. Freeman and Company
3	Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments (6th Edition). John Wiley & Sons
4	Berg, J. M., Tymoczko, J. L., & Gatto, G. J. (2015). Biochemistry (8th Edition). W.H. Freeman and Company
5	Glick, B. R., & Pasternak, J. J. (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA (4th Edition). ASM Press
1	Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments (6th Edition). John Wiley & Sons.
2	Campbell, N. A., Reece, J. B., & Urry, L. A. (2008). Biology (8th Edition). Pearson Education.
3	Watson, J. D., Baker, T. A., Bell, S. P., et al. (2007). Molecular Biology of the Gene (6th Edition). Pearson.
4	Stryer, L., Berg, J. M., & Tymoczko, J. L. (2002). Biochemistry (5th Edition). W.H. Freeman.
5	Cell Signaling: Principles and Mechanisms, 2nd Edition (2014), by Wendell Lim, Bruce Mayer, and Tony Pawson.
1	https://www.ncbi.nlm.nih.gov
2	https://cellbio.uia.edu
3	https://www.garlandscience.com
4	https://www.khanacademy.org/science/biology
5	https://www.coursera.org/courses?query=cell%20biology

Course outcomes CO	On completion of this course, students will be able to
CO1	Understand fundamental cell biology concepts
CO2	Analyze cell structure and function
CO3	Comprehend molecular mechanisms of inheritance
CO4	Explore cellular metabolism
CO5	Apply molecular techniques in biology

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Herbal Technology

Title of the Course	**Herbal Technology**						
Course Type	**Skill Enhancement Course**						
Year	**II**	**Semester**	**III**	**Credits**	**2**	**Course Code**	**24USBO32**
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**			
	2	**-**	**--**	**2**			
Pre-requisite	**To understand the importance of herbal technology..**						

Learning Objectives

LO 1	To provide an overview of Herbal medicines.
LO 2	To gain an insight into the commercially important secondary products
LO 3	To understand the basic concept of Pharmacognosy
LO 4	To recognize the phytochemical screening methods.
LO 5	To know the methods of processing and storage of herbal drugs

Unit	Contents
I	Herbal Technology: Definition and scope; Herbal medicines: history and scope; Traditional systems of medicine, and overview of AYUSH (Traditional Indian Systems of Medicine); Cultivation, harvesting, processing and storage of herbs and herbal products.
II	Major herbs used as herbal medicines-, Ocimum. Nutraceuticals- Embilica officinale,, cosmeticals- Aloe vera, and biopesticides-Neem,, their Botanical names, plant parts used, major chemical constituents and their uses.
III	Pharmacognosy - Binomial, botany of the plant part used and active principles of the following herbs: Curcuma, Fenugreek, Catharanthus roseus, Withania somnifera, Centella asiatica, Tinospora.
IV	Analytical pharmacognosy: Phytochemical screening tests for secondary metabolites - alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds.
V	Processing - storage of herbs and herbal products, quality control for use in herbal formulations.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts:	
1	AYUSH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare, Government of India
2	Evans, W.C. 2009: Trease and Evans PHARMACOGNOSY. 16th Edition, SAUNDERS / Elsevier.l Science. 10.2174/97898114337881200101.
3	Sivarajan, V.V. and India, B. 1994. Ayurvedic Drugs and Their Plant Sources.. Oxford & IBH Publishing Company, 1994 - Herbs - 570 pages.
4	Miller, L. and Miller, B. 2017. Ayurveda & Aromatherapy: The Earth Essential Guide to Ancient Wisdom and Modern Healing. Motilal Banarsidass,; Fourth edition .
5	Kokate, C.K. 2003. Practical Pharmacognosy. Vallabh Prakashan, Pune.
References Books:	
1	Agarwal, P., Shashi, Alok., Fatima, A. and Verma, A. 2013. Current scenario of Herbal Technology worldwide: An overview. Int J Pharm Sci Res; 4(11): 4105-17.
2	Arbe r, Agnes. 1999. Herbal Plants and Drugs. Mangal Deep Publications, Jaipur..
3	Varzakas, T., Zakynthinos, G, and Francis Verpoort, F. 2016. Plant Food Residues as a Source of Nutraceuticals and Functional Foods. Foods 5 : 88.
4	Aburjai, T. and Natsheh, F.M. 2003. Plants Used in Cosmetics. Phytotherapy Research 17 :987-1000.4.
5	Patri, F. and Silano, V. 2002. Plants in cosmetics: Plants and plant preparations used as ingredients for cosmetic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.

Web Resources:	
1	https://www.kopykitab.com/Herbal-Science
2	2.https://kadampa.org/books/free-ebook-download-howtotyl?gclid=CjwKCAiA6vXwBRBKEiwAYE7
3	3.https://www.barnesandnoble.com/b/free-ebooks/nook-books/alternative-medicine-natural- healing/herbal-medicine/_/
4	4.http://cms.herbalgram.org/heg/volume8/07July/HerbalEBooks.html?t=13 10004932&ts= 1579066352&signature=1dd0d5aef818b19bcdcd6c063a78e404
5	5.https://www.dattanibookagency.com/books-herbs-science.html

Course outcomes CO	**On completion of this course, students will be able to**
CO1	Define and describe the principle of cultivation of herbal products.
CO2	List out the categories of commercially important herbal medicines
CO3	List out the categories of commercially important herbal medicines
CO4	Apply phytochemical tests for identification of secondary metabolites
CO5	Analyze and decipher the significance of various methods of harvesting, drying and storage of medicinal herbs.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Silviculture and Agroforestry

Title of the Course		Silviculture and Agroforestry					
Course Type		Skill Enhancement Course					
Year	II	Semester	III	Credits	2	Course Code	24USBO33
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		2			--	2	
Pre-requisite		To understand the Cell structure and functions.					

Learning Objectives	
LO 1	To provide knowledge regarding the application of silvi cultural principles for the production and protection benefits from the forests.
LO 2	To make students familiar with trees and shrubs (fruit, fodder and small timber) suitable for agroforestry.
LO 3	To acquaint the students with the advanced silvi cultural practices in forestry with particular reference to commercial and short rotation forestry.
LO 4	To develop understanding about tree seed development, harvesting, processing, storage, dormancy, germination of tropical, sub-tropical and temperate species, their testing and certification.
LO 5	To develop skill and expertise on industrial wood production and processing technology.

Unit	Contents
I	Forests - definition. Extent of forests in India and other countries. Forest types of India and Tamil Nadu. Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment Plantation forestry - reforestation and afforestation - maintenance of plantations - enrichment planting.
II	Silvi culture - objectives - scope - general principles. Regeneration - natural and artificial. Nursery techniques - containerized seedling production - techniques and methods. Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques.
III	Tending operations - weeding, cleaning, thinning, pruning, after care techniques; cultural operations - soil working. Silvicultural systems - clear felling, shelter wood, selection and coppice systems - improvement felling.
IV	**Agro-forestry and Social Forestry** Definition, concept and need of agro- and Social Forestry Classification of agro-forestry and Social Forestry systems. Ecological aspects of agroforestry - benefits and limitations of agroforestry. Agroforestry practices for different agro-climatic zones of Tamil Nadu. Agroforestry practices for wasteland reclamation
V	Social forestry - objectives and scope and necessity - its components and implementation in local and national levels - social attitudes and community participation. JFM - principles, objectives and methodology - choice of species for agro forestry and social forestry. Urban Forestry - definition and scope - benefits - choice of tree species – planting techniques and management

Text books	
1.	Daniel TW, Helms JA and Baker FS. 1979. Principles of Silviculture. McGraw-Hill Book Company.
2.	Julius E. 1992. Plantation Forestry in the Tropics. Oxford University Press
3.	Khanna LS. 1996. Principle and Practice of Silviculture. International Book Distributors
4.	Khanna LS. 2015. Theory and Practice of Indian Silviculture Systems. Bio-Green Publisher
5.	Lamprecht. 1986. Silviculture in the Tropics.Verlag Paul Parey, Hamburg und Berlin
Reference Books	
1.	Nyland RD, Laura S, Kenefic, Kimberly K, Bohn and Susan LS.2016 Silviculture: Concepts and Applications (III
2.	Pascal. 1988. Wet Evergreen Forests of the Western Ghats.
3.	Shepherd KR. 1986. Plantation Silviculture. Springer.
4.	Smith DM, Larson BC, Ketty MJ and Ashton PMS. 1997. The Practices of Silviculture- Applied Forest Ecology.John Wiley & Sons
5.	Khanna LS. 2015. Theory and Practice of Indian Silviculture Systems. Bio-Green Publisher
Web Resources	
1.	https://en.wikipedia.org/wiki/Agroforestry
2.	https://www.uou.ac.in/lecturenotes/science/BSC- 17/FR01Unit%2001.pdf
3.	https://www.ctc-n.org/technology-library/agro-forestry-silviculture-mixed-farming/general-agro-forestry-silviculture-

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Blue Print – End Semester Examinations – November 2024
Semester -I

Class: U.G. / P.G.   Time: 3 Hours   Max. Marks: 75

Section A (10 x 1 = 10)

Answer ALL questions.
Choose the correct answer. (With four options)

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	1 & 2	3 & 4	5 & 6	7 & 8	9 & 10

Section B (5 x 5 = 25)

Answer ALL questions choosing either (a) or (b).
Answer should not exceed 250 words

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	11 (a) & 11 (b)	12 (a) & 12 (b)	13 (a) & 13 (b)	14 (a) & 14 (b)	15 (a) & 15 (b)

Section C (5 x 8 = 40)

Answer ALL questions choosing either (a) or (b).
Answer should not exceed 500 words.

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question No.	16 (a) & 16 (b)	17 (a) & 17 (b)	18 (a) & 18 (b)	19 (a) & 19 (b)	20 (a) & 20 (b)