MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL-624 101

DEPARTMENT OF BIOTECHNOLOGY

B.Sc. BOTANY
Curriculum Framework, Syllabus, and Regulations
(Based on TANSCHE Syllabus under choice Based Credit System – CBCS)

(For the candidates to be admitted from the Academic Year 2023-2024)

About the Programme

This is a 3 year long undergraduate programme which is generally divided into six semesters. It deals with the basic principles of plant biology and related fields. It covers topics like plant kingdom, Taxonomy, microbiology, genetics and ecology etc. The course incorporates core courses, electives and practical. The delivery methods for B.Sc. Botany courses involve theoretical classes, lab work and hands-on practical training, outdoor tours etc. The students completing this programme generally go for higher education to build a career in academics, public and private sectors.

Programme Educational Objective

1. Develop the curriculum for fostering discovery-learning and know the importance of discipline
2. Inculcate interest in nature with its myriad living forms
3. Impart knowledge of Science as the basic objective of Education
4. Create a scientific approach to make students open-minded, critical, curious and make aware of natural sciences
5. Develop the ability to work hard and produce students to become entrepreneur who are fit for society

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc. BOTANY**
Programme Code:	
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. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to: **PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory. **PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively **PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities. **PSO4: Analytical & Scientific Reasoning:** Apply scientific methods, collect and

	analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models. **PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects. **PSO6: Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

Eligibility

i. Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Examination, Govt. of Tamilnadu or any other Examination accepted by the syndicate as equivalent there to with at least one of the following subject Biology/Botany
ii. Candidate should have secured atleast 55% in the above subject and above in the aggregate.
iii. A relaxation of 10% in the total percentage will be given to SC, ST candidates

General Guidelines for UG Programme

i. **Duration:** The programme shall extend through a period of 6 consecutive semesters and the duration of a semester shall normally be 90 days or 450 hours. Examinations shall be conducted at the end of each semester for the respective subjects.
ii. **Medium of Instruction:** English
iii. **Evaluation:** Evaluation of the candidates shall be through Internal Assessment and External Examination.

Attendance

Students must have earned 75% of attendance in each course for appearing for the examination. Students with 71% to 74% of attendance

must apply for condonation in the Prescribed Form with prescribed fee. Students with 65% to 70% of attendance must apply for condonation in the Prescribed Form with the prescribed fee along with the Medical Certificate. Students with attendance less than 65% are not eligible to appear for the examination and they shall re-do the course with the prior permission of the Head of the Department, Principal and the Registrar of the University.

Maternity Leave

The student who avails maternity leave may be considered to appear for the examination with the approval of Staff i/c, Head of the Department, Controller of Examination and the Registrar.

Any Other Information

In addition to the above mentioned regulations, any other common regulations pertaining to the UG Programmes are also applicable for this Programme.

Methods of Evaluation Theory		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	**100 Marks**
	Methods of Evaluation of Practicals	
	Continuous Internal Assessment Test	40 Marks
	Attendance and Class Participation	
External Evaluation	End Semester Examination	60 Marks
	Record	
	Total	**100 Marks**
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	Longer essay/ Evaluation essay, Critique or justify with pros and cons	

(K5)	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

MOTHER TERESA WOMEN'S UNIVERSITY,KODAIKANAL
B.Sc. BOTANY SYLLABUS
2023-2024

SEMESTER-I								
Course Code	**Course Title**	**Hours**			**Credits**	**CIA**	**ESE**	**Total**
		L	**T**	**P**				
U23TAL11	Language 1-Tamil	3	3		3	25	75	100
U23ENL21	Language 2-English	3	3		3	25	75	100
U23BOT11	Core 1 Plant Diversity I – Algae	3	2		5	25	75	100
U23BOP11	Core 2 Practical I - Plant Diversity I Algae			5	5	25	75	100
U23BOA11	Allied I: Zoology	2	2		3	25	75	100
U23BOS1A / U23BOS1B / U23BOS1C	Skill Enhancement Course 1 (NME) - A. Organic farming B. Environmental Biotechnology C. Nursery and Landscaping		2		2	25	75	100
U23BOF11	Foundation Course - Ethno Botany and Ethnopharmacognosy		2		2	25	75	100
	Total	**30**			**23**	**-**	**-**	**700**
SEMESTER-II								
U23TAL12	Language 1-Tamil	3	3		3	25	75	100
U23ENL22	Language 2-English	3	3		3	25	75	100
U23BOT22	Core 3 Plant Diversity II – Fungi, Bacteria, Viruses, Plant pathologyand Lichens	3	2		5	25	75	100

U23BOP22	Core 4 Practical II –Plant Diversity II - Fungi, Bacteria, Viruses, pathology and			5	5	25	75	100
U23BOA22	Allied II: Zoology	2	2		3	25	75	100
U23BOS22	Skill Enhancement Course II Soft Skills			2	2	25	75	100
U23BOS31	Skill Enhancement Course III (NME) Botanical Garden and Landscaping		2		2	25	75	100
	Total	**30**			**23**	**-**	**-**	**700**

CORE-I PLANT DIVERSITY I ALGAE

Title of the Course		**PLANT DIVERSITY I ALGAE**					
Paper Number		**CORE I**					
Category	Core	**Year**	I	**Credits**	5	**Course Code**	**U23BOT11**
		Semester	I				
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		3	2	--	5		
Pre-requisite		Students should be familiar with the basics of different classes of algae.					

Learning Objectives		
C1	To provide a comprehensive knowledge on the biology of algae.	
C2	To provide a basis for better understanding of the evolution higher of plants.	
C3	To understand reproductive biology, ecology of plants by studying the simpler systems in algae.	
C4	To understand the role of algae in ecosystems as primary producers of nutrition.	
C5	To understand importance of algae to animals and humans.	
Course outcomes	On completion of this course, students will;	
CO1	Relate to the structural organization, reproduction and significance of algae.	K1
CO2	Demonstrate knowledge in understanding the various life cycle patterns and the fundamental concepts in algal growth	K2
CO3	Explain the benefits of various algal technologies on the ecosystem.	K3
CO4	Compare and contrast the thallus organization and modes of reproduction in algae.	K4
CO5	Determine the emerging areas of Algal Biotechnology for identifying commercial potentials of algal products and their uses.	K5
UNIT	**CONTENTS**	
I	Classification (Fritsch-1935-1945), criteria for classification, algal distribution.	
II	Thallus organization (unicellular-*Chlorella*, Diatoms, colonial-*Volvox*, filamentous-*Anabaena*, *Oedogonium*, siphonous-*Caulerpa*, parenchymatous-*Sargassum*, *Gracilaria*).	
III	Reproduction-Vegetative, asexual, sexual reproduction and life histories (haplontic-, *Oedogonium* and *Chara*, diplontic-Diatoms and *Sargassum*, diplohaplontic-*Ulva* and diplobiontic-*Gracilaria*) (Examples may be changed according to the availability of the specimens).	
	Algal cultivation methods, Algal production systems; indoor cultivation methods and large-scale cultivation of algae, harvesting of algae.	

IV	
V	Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite. Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical. Phycoremediation. Role of algae in CO_2 sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence.
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	Dehradun. Edwardlee, R. 2018. Phycology, 5th Ed., Cambridge University Press, London.
2	Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi
3	Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.
4	Vashishta, P.C. 2014. S.Chand & Company Ltd, New Delhi.
5	Ian Morris. 1977. An introduction to the algae. Hutchinson & Co (Publishers) Ltd. London.
References Books:	
1	Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani.ISBN: 978-9922-20-391-1.
2	Mihir Kumar, D. 2010. Algal Biotechnology. Daya Publishing House, New Delhi.

3	Chapman V.J. and Chapman D.J, 2013. The Algae. Alpha Numera.
4	Fritsch, F.E. 1945. Structure and reproduction of Algae. Cambridge University press.
5	Round, FE. 1984.The Ecology of Algae. Cambridge University Press.
6	Lee, R.D. 2008.Phycology 4th Edition, Cambridge University Press, New York.
7	Bold, H.C and Wynne, M.J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi.
Web Resources:	
1	https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382
2	https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382
3	https://www.crcpress.com/Algae-Anatomy-Biochemistry-and-Biotechnology-Second-Edition/Barsanti-Gualtieri/p/book/9781439867327
4	https://www.crcpress.com/Marine-Algae-Biodiversity-Taxonomy-Environmental-Assessment-and-Biotechnology/Pereira-Neto/p/book/9781466581678
5	https://www.kopykitab.com/Botany-For-Degree-Students-ALGAE-by-B-R-Vashishta-Dr-A-K-Sinha-Dr-V-P-Singh
6	https://www.wileyindia.com/a-textbook-of-algae.html
7	https://www.kobo.com/in/en/ebook/algae-biotechnology
8	https://www.ikbooks.com/books/book/life-sciences/botany/a-textbook-algae/9788188237449/

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	1	3	2	1	2	2	2	1
CO 2	3	3	2	2	3	3	2	`1	3	3
CO 3	2	2	1	1	2	2	1	3	2	2
CO 4	3	3	3	3	3	2	3	3	3	2
CO 5	3	3	2	3	2	3	3	3	2	3

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

CORE-II PLANT DIVERSITY I ALGAE - PRACTICAL-I

Title of the Course	**PLANT DIVERSITY – I: ALGAE Practical I**						
Paper Number	CORE II						
Category	Core	**Year**	I	**Credits**	5	**CourseCode**	**U23BOP11**
		Semester	I				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	2	-	3	5
Pre-requisite	Students should be familiar with the basics of algae.			

Learning Objectives

C1	To develop skills to identify algae based on habitat, thallus structure and the internal organization.
C2	To identify microalgae in a mixture.
C3	To develop skills to prepare the microslides of algae.
C4	To study the economic importance of few species.
C5	To understand importance of algae to animals and humans

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

EXPERIMENTS

1. Micro-preparation of the types prescribed in the syllabus. 2. Identifying the micro slides relevant to the syllabus. 3. Identifying types of algal mixture. 4. Economic importance of Algae as: (i) Food (ii) Feed (iii) Biofertilizers (iv) Seaweed liquid fertilizer (v) Hydrogen production by algae (vi) SCP (vii) Agar Agar (viii) Alginate (ix) Diatomaceous earth. 5. Field visit to study fresh water/marine water algal habitats. 6. Visit to nearby industry actively engaged in algal technology.	
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. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi. 2. Bendre, M. Ashok and Ashok Kumar, A. 2020. Text Book of Practical Botany-1 (10th ed).Rastogi Publications, Meerut. 3. Round, FE. 1984.The Ecology of Algae. Cambridge University Press. 4. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani.ISBN: 978-9922-20-391-1. 5. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.
Reference Books:	1. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying 2. manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher. 3. Chapman, V.J and Chapaman, D.J. 1960.The Algae, ELBS & MacMillan, London. 4. Lee, R.D. 2008.Phycology 4th Edition, Cambridge University Press, New York. 5. Dehradun. Edwardlee, R. 2018. Phycology, 5th Ed., Cambridge University Press, London.
Web resources:	1. https://www.amazon.in/Practical-Manual-Algae-Sundara-Rajan/dp/8126106492 2. https://books.google.co.in/books/about/Practical_Manual_of_Algae.html?id=8d5DAAAACAAJ&redir_esc= 3. https://freebookcentre.net/biology-books-download/Concepts-of-Botany-Algae-(PDF-21P).html 4. https://www.ebooks.com/en-in/book/210152662/algae/sachin-kumar-mandotra/ 5. https://books.google.co.in/books/about/Algae.html?id=s1P855ZWc0kC&redir_esc=y

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	3	2	1
CO 2	3	3	2	2	3	3	2	3	3	3
CO 3	2	2	3	3	1	2	1	3	1	2
CO 4	3	3	3	3	3	2	3	3	3	2
CO 5	3	3	2	2	2	3	3	3	2	3

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

CORE-III PLANT DIVERSITY II FUNGI, BACTERIA, VIRUSES, PLANT PATHOLOGY AND LICHENS

Title of the Course	**PLANT DIVERSITY – II: FUNGI, BACTERIA, VIRUSES, PLANT PATHOLOGY AND LICHENS**						
Paper Number	CORE III						
Category	Core III	**Year**	I	**Credits**	5	**Course Code**	**U23BOT22**
		Semester	II				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	3	2	--	5

Pre-requisite	Students should be familiar with the basics of fungi, bacteria, viruses and lichens.
Learning Objectives	
C1	To describe the common characteristics of fungi as being heterotrophic, unicellular/multicellular.
C2	To understand the biology of fungi and to discuss the importance of fungi in various ecological roles
C3	To understand lichen structure, function, identification, and ecology; Comprehend the events of symbiosis and lichenization and to demonstrate the use of lichens as bioindicator species.
C4	To identify the main groups of plant pathogens, their symptoms.
C5	To understand the various types of plant diseases.
Course outcomes: **On completion of this course, the students will be able to:** **CO**	Programme outcomes
1. Recognize the general characteristics of microbes, fungi and lichens and disease symptoms.	K1
2. Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies based on structural organization.	K2
3. Identify the common plant diseases, according to geographical locations and device control measures.	K3
4. Analyze the emerging trends in fungal	K4

biotechnology with special reference to agricultural and pharmaceutical applications.	
5. Determine the economic importance of microbes, fungi and lichens.	K5

UNIT	EXPERIMENTS
I	**FUNGI** Classification of fungi - (Alexopoulos and Mims, 1979), criteria for classification, Characteristic features, thallus organization, mode of nutrition, structure, reproduction and life-history of classes, each with one suitable example: Zygomycotina (*Pilobolus*, *Mucor*, *Rhizopus*), Ascomycotina (*Aspergillus*, *Saccharomyces Peziza*), Basidiomycotina (*Agaricus*, *Pleurotus*, *Puccinia*) and Deuteromycotina (*Cercospora*, *Alternaria*). (Examples may be changed according to the availability of the specimens). Importance of mycorrhizal association.
II	**ECONOMIC IMPORTANCE OF FUNGI:** Cultivation of mushroom – *Pleurotus* (food). Fungi in agriculture application (biofertilizers): Mycotoxins (biopesticides), Production of industrially important products from fungi- alcohol (ethanol), organic acids (citric acid), enzymes (protease). Vitamins (Vitamin B-complex and Vitamin B-12), applications of fungi in pharmaceutical products (Penicillin). Importance of VAM fungi. Harmful effects of Fungi. Agriculture (Biofertilizers); Mycotoxins
III	**BACTERIA, VIRUS:** Classification (Bergey's, 1994), structure and reproduction of bacteria, Mycoplasma, Virology -Viruses general characters, structure and reproduction.
IV	**PLANT PATHOLOGY:** General symptoms of plant diseases; Geographical distribution of diseases; Etiology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of the following plant diseases. General characters of Bacteria and Viruses. **Bacterial diseases** – Citrus canker and Bacterial wilt of Banana **Viral diseases** – Tobacco Mosaic and Vein clearing of Papaya **Fungal diseases** – Blast disease in rice and Tikka disease
	LICHEN: Classification (Hale, 1969). Habitat, nature of association, Structure, Nature of Mycobionts and Phycobionts, Study of growth forms of lichens (crustose, foliose and fruticose), types, distribution, thallus organization, reproduction and ecological significance of lichens with special reference to *Usnea*.

V	**Economic importance of Lichens**: food, fodder and nutrition, flavor, tanning and dyeing, cosmetics and perfumes, Brewing and distillation, minerals, Natural products, medicine (Ayurvedic, Siddha), pharmaceutical products, biodegradation agent, air pollution and biomonitoring, soil formation, nitrogen fixation, Harmful aspects, poison from lichens,
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. Pandey, B.P. 1997. College Botany. Vol. I Fungi & Pathology. 2. Mehrotra, R.S and Aneja, K.R. 2003. An introduction to mycology. New age International (P) Ltd, Publishers, New Delhi. 3. Poonam Singh and Ashok Pandey. 2009. Biotechnology for agro-Industrial residues utilization. Springer. 4. Satyanarayana T and Johri B.N. 2005. Microbial diversity, Current Perspectives and Potential Applications, IK International. 5. Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata. 6. Sharma, P.D. 2011. Plant Pathology, Rastogi Publication, Meerut, India. 7. Mahendra Rai. 2009. Advances in Fungal Biotechnology. I.K. International Publishing House, New Delhi.
Reference Books	1. Alexopoulos, C.J., Mims, C.W., Blackwell, M. 1996. Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore. 2. Webster, J and Weber, R. 2007. Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge. 3. Sharma, O.P. 2011. Fungi and allied microbes The McGraw –Hill companies, New Delhi. 4. Burnett, J.H. 1971.The fundamentals of Mycology. ELBS Publication, London. 5. Bessey, E.A. 1979. Morphology and Taxonomy of fungi, Vikas publishing House Pvt. Ltd, New Delhi. 6. Dharani Dhar Awasthi. 2000. A Handbook of Lichens Vedams eBooks (P)

	Ltd. New Delhi. 7. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. 1983. Microbiology , Tata MaGraw Hill Publishing House, New Delhi. 8. Pandey, P.B. 2014. College Botany- 1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. Chand Publishing, New Delhi. 9. Mishra, A. and Agarwal, R.P. 1978. Lichens – A Preliminary Text. Oxford and IBH. 10. Pandey, B.P. 2005. College Botany I: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S Chand & Company
Web Resources	1. https://www.amazon.in/Fungi-Sarah-C-Watkinson-ebook/dp/B0199YFDFE 2. http://www.freebookcentre.net/biology-books-download/A-text-book-of-mycology-and-plant-pathology.html 3. http://www.freebookcentre.net/Biology/Mycology-Books.html 4. https://www.kobo.com/us/en/ebook/introduction-to-fungi 5. http://www.freebookcentre.net/biology-books-download/Introductory-Mycology.html 6. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html

Mapping with Programme Outcomes:

COs	COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	1	2	2	2	2
CO 2	3	3	2	2	3	3	2	1	2	1
CO 3	2	2	3	3	1	2	1	3	1	3
CO 4	3	3	3	3	3	2	3	3	3	3
CO 5	3	3	2	3	2	3	3	3	3	3

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

CORE-IV PLANT DIVERSITY II FUNGI, BACTERIA, VIRUSES, PATHOLOGY AND LICHENS - PRACTICAL-II

Title of the Course	**PLANT DIVERSITY** – I: **FUNGI, BACTERIA, VIRUSES, PLANT PATHOLOGY AND LICHENS –Practical II**						
Paper Number	CORE IV						
Category	Core	**Year**	I	**Credits**	5	**Course Code**	**U23BOP22**
		Semester	II				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	2	-	3	5
Pre-requisite	Students should be familiar with the basics of fungi and lichens.			

Learning Objectives	
C1	To enable students to identify microscopic and macroscopic fungi.
C2	To prepare microslides of fungi and lichens.
C3	To know the presence of pathogen inside the plant tissues through microscopic sections.
C4	To identify the bryophytes based on the morphology, and microslides.
C5	To know the economic importance of the microbes studied.

Course outcomes On completion of this course, the students will be able to: **CO**	**Programme Outcomes**
1 Identify microbes, fungi and lichens using key identifying characters	K1
2. Develop practical skills for culturing and cultivation of fungi.	K2
3. Identify and select suitable control measures for the common plant diseases.	K3
4. Analyze the characteristics of microbes, fungi and plant pathogens	K4
5. Access the useful role of fungi in agriculture and pharmaceutical industry.	K5

EXPERIMENTS

1. Microscopic observation of vegetative and reproductive structures of types prescribed in the syllabus through temporary preparations and permanent slides.
2. Identifying the micro slides relevant to the syllabus.
3. Herbarium specimens of bacterial diseases/photograph.
3. Protocol for mushroom cultivation.
4. Inoculation techniques for fungal culture (Demonstration only).
5. Study of economically important products obtained from fungi: Fungal biofertilizers, biopesticides, biofungicide (*Trichoderma*), edible mushroom/Yeast, organic acids (citric acid) enzymes (protease), antibiotics and vitamins.
6. Mycorrhiza: ecto-mycorrhiza and endo-mycorrhiza (Photographs)
7. Visit to fungal biotechnology laboratories.
8. Ultra sturcture of bacteria.
9. Structure of bacteriophage.
10. Micro-preparation of *Usnea* to study vegetative and reproductive structures.
11. Identifying the micro slides relevant to the syllabus.
12. Study of thallus and reproductive structures (apothecium) through permanent slides.
13. Economic importance of Lichens - Dye and perfume.

Recommended Texts:

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

Reference Books:

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

Web resources:

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

Mapping with Programme Outcomes:

COs	COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	1	2	2	2	1
CO 2	2	3	2	2	3	3	2	3	3	3
CO 3	2	2	3	3	1	2	1	3	1	2
CO 4	3	3	3	3	3	2	3	3	3	2
CO 5	3	3	2	3	2	3	3	3	2	3

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

NON-MAJOR ELECTIVE-I
1. ORGANIC FARMING

Title of the Course	**ORGANIC FARMING**						
Paper Number	Non-Major Elective-I						
Category	Elective	**Year**	I	**Credits**	2	**Course Code**	**U23BOS1A**
		Semester	I				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	2	-	-	2
Pre-requisite	Students to gain knowledge on the scope of organic farming and its significance.			

Learning Objectives	
C1	To enable students to gain knowledge on the scope of organic farming and its significance.
C2	To impart practical insights sustainable agriculture, green manuring, recycling and composting.
C3	To understand the physical and chemical properties of soil.
C4	To study sustainable agriculture.
C5	To know about the importance of biofertilizers.

Course outcomes: On completion of this course, the students will be able to: CO	**Programme Outcomes**
1. Recognize the different forms of biofertilizers and their uses.	**K1**
2. Explain and interpret the components, patterns, and processes of bacteria for growth in crop production.	**K2**
3. Apply techniques for synthesizing green manure and develop strategies to increase crop yield.	**K3**
4. Analyze and decipher the significance of biofertilizers in soil fertility.	**K4**
5. Develop new strategies to enhance growth	**K5**

and quality check of medicinal herbs considering the practical issues pertinent to India.	

UNIT	CONTENTS
I	Soil – physical, chemical properties. Soil pollution – oil, chemicals –fertilizers, pesticide and herbicide, non-degradable solids, biomagnification, consequences of land pollution – damage to soil and crops.
II	Organic farming – definition, basic concept of organic farming, integrated plant nutrient supply management, integrated insect pest and disease management, integrated soil and water management. Sustainable agriculture practices-crop rotation, mixed cropping.
III	Management of organic wastes and green manures: Farm manures, Composts, Mulches and pest control, importance of organic manure, importance of green manure, crops of green manure, oil cake. Animal based organic manure–cow dung, vermicompost-methods, production and utilization.
IV	Biofertilizers–classification, nitrogen fixers–*Rhizobium*, Cyanobacteria, *Azolla* and Vesicular Arbuscular Mycorrhiza.
V	Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods.

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 competitiveexaminations 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. NIIR Board. 2012. The complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services. 2. Sathe, T.V. 2004. Vermiculture and Organic Farming. Daya publishers. 3. Subba Rao N.S. 2017. Biofertilizers in Agriculture and Forestry. Fourth Edition.Medtech. Vayas,S.C, Vayas, S. and Modi, H.A. 1998. Bio-fertilizers and organic Farming Akta Prakashan, Nadiad.

	Dongarjal, R.P and Zade, S.B. 2019. Insect Ecology and Integrated Pest Management Akinik Publications, New Delhi.
Reference Books	1. Vayas,S.C, Vayas, S and Modi, H.A. 1998. Bio-fertilizers and organic Farming Akta Prakashan, Nadiad. 2. Sathe, T.V.2004. Vermiculture and Organic Farming. Daya publishers. 3 Subha Rao, N.S.2000. Soil Microbiology, Oxford & IBH Publishers, New Delhi. Reddy, S.R. 2019. Fundamentals of Agronomy Kalyani Publications, Uttar Pradesh Tolanur, S. 2018. Fundamentals of Soil Science IIndEdition , CBS Publishers , New Delhi
Web Resources	1. https://www.amazon.com/Beginners-Practical-botanical-horticulture-landscape-ebook/dp/B00MOURUNY 2. https://www.e-booksdirectory.com/listing.php?category=323 3. http://www.freebookcentre.net/Biology/Agriculture-Books.html 4.https://casfs.ucsc.edu/about/publications/Teaching-Organic-Farming/PDF-downloads/TOFG-all.pdf 5. https://www.amazon.in/s?k=the+organic+farming+manual&hvadid=72636563575133&hvbmt=bb&hvdev=c&hvqmt=b&tag=msndeskstdin-21&ref=pd_sl_6sbf0qtxcy_b

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2	1	2	2	2	2
CO 2	3	3	2	1	2	3	2	3	2	3
CO 3	2	2	3	3	1	2	2	3	2	3
CO 4	3	2	1	1	2	3	2	3	2	3
CO 5	3	3	2	3	1	2	3	3	3	3

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

NON-MAJOR ELECTIVE-I
2. ENVIRONMENTAL BIOTECHNOLOGY

Title of the Course	**ENVIRONMENTAL BIOTECHNOLOGY**						
Paper Number	Non-Major Elective-I						
Category	Elective	**Year**	I	**Credits**	2	**Course Code**	**U23BOS1B**
		Semester	I				
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		2	-	-	2		
Pre-requisite	To understand the various applications of environmental biotechnology.						

Learning Objectives	
C1	To introduce the student to the various developed and applications of environmental biotechnology.
C2	To provide knowledge about the scope of bioremediation and bioleaching using GMOs.
C3	To study about pollution of water bodies.
C4	To know about bioremediation.
C5	To study about biomineralization.

Course outcomes: On completion of this course, the students will be able to: CO	**Programme Outcomes**
1. Recognize the various causes of pollution and control measures.	**K1**
2. Explain about the beneficially role of GMOs on environment.	**K2**
3. Reflect upon various sustainable environmental protection strategies.	**K3**
4. Analyze the different methods of air, water, and soil quality monitoring process.	**K4**
5. Evaluate the implications of international legislations and policies for environmental protection.	**K5**

UNIT	**CONTENTS**
I	**Introduction:** The environment-soil, water and air, Pollution and its causes (outline only)

II	**Source and treatment of polluted waters and effluents:** Pollution of water bodies by heavy metals and pesticides – removal of heavy metals and pesticides by Biosorption. Removal of oil spills by using microbes. Biological treatment of sewage – characteristics of sewage and objectives in sewage treatment – Anaerobic digestion.
III	**Soil and air pollution and their treatment:** Soil pollution by Xenobiotics. Degradation of Xenobiotics – pathways of phenol, pentachlorophenol and polychlorinated biphenyl degradation.
IV	**Bioremediation:** Introduction to bioremediation, *ex situ* and *in situ* bioremediation.
V	**Biometallurgy and related topics:** Biomineralization – bioleaching - Biofilms and biocorrosion.
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. Alan Scragg. 1999. Environmental Biotechnology. Pearson Education Limited. 2. Dubey R.C. 2004. A text book of Biotechnology aspects of microbiology, British Sun Publication. 3. Joseph C. Deniel. 1996. Environmental aspects of microbiology, British Sun Publication. 4. Keeshav Thehan. 1997. Biotechnology, New age international)P) Limited, New Delhi. 5. Chandra, A.M and Ghosh, S.K. 2010. Remote sensing and Geographical Information System, Narosa Publishing House Pvt. Ltd. New Delhi.
Reference Books:	1. Sharma, P.D. 2005. Environmental Microbiology, Narosa Publishing House Pvt. Ltd., New Delhi. 2. Raina Maier M. Iran Pepper L., Charles P. Gerba, 2000, Environmental Microbiology, Academic press, U.K.

	3. Alexander N. Glazer and Hiroshi Nikaido. 1994. Microbial Biotechnology. 4. Special issue on Bioremediation and biodegradation. Indian Journal of Experimental Biology, September 2003. Vol. 41(9). National Institute of Science Communication and Information Resources, CSIR New Delhi. Keddy, P.A. 2017. Plant Ecology: Origins, processes, consequences. 2nd ed. Cambridge University Press. ISBN. 978-1107114234.
eb Resources	1. https://www.elsevier.com/books/environmental-biotechnology/vallero/978-0-12-407776-8 2. http://www.freebookcentre.net/biology-books-download/Environmental-Biotechnology.html 3. https://www.amazon.in/INTRODUCTION-ENVIRONMENTAL-BIOTECHNOLOGY-K-Chatterji-ebook/dp/B00K7YGIWI 4. https://books.google.co.in/books/about/Textbook_of_Environmental_Biotechnology.html?id=Q2ROFx0WtBQC&redir_esc=y 5. http://library.umac.mo/ebooks/b28045907.pdf

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	2	1	3
CO 2	3	3	2	2	2	3	2	3	2	2
CO 3	2	2	3	3	1	2	1	3	3	3
CO 4	3	3	3	3	3	2	3	3	3	3
CO 5	3	3	2	3	2	3	3	3	2	3

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

NON-MAJOR ELECTIVE-I
3. NURSERY AND LANDSCAPING

Title of the Course	**NURSERY AND LANDSCAPING**						
Paper Number	Non-Major Elective-I						
Category	Elective	**Year**	I	**Credits**	2	**Course Code**	**U23BOS1C**
		Semester	I				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**			
	2	-	-	2			
Pre-requisite	Students should know about the fundamental concepts of nursery and landscaping.						

earning Objectives	
C1	o recognize the importance of growing plants and practice the knowledge gained by developing kitchen garden and ornamental garden.
C2	o be able to design gardens and become entrepreneur in Horticulture.
C3	To study the methods of propagation.
C4	o know about nursery structure.
C5	To learn about gardening.

Course outcomes: On completion of this course, the students will be able to: CO	**Programme Outcomes**
1. Recognize the basic principles and components of gardening.	K1
2. Explain about bio-aesthetic planning and conceptualize flower arrangement.	K2
3. Apply techniques for design various types of gardens according to the culture and art of bonsai.	K3 & K6
4. Compare and contrast different garden styles and landscaping patterns.	K4
5. Establish and maintain special types of gardens for outdoor and indoor landscaping.	K5 & K6

UNIT	**CONTENTS**
I	Introduction, prospects and scope of nursery and landscaping.
II	Methods of Propagation – cutting, layering, grafting, budding, Floriculture – Rose, Chrysanthemum, Jasmine – cultivation.

III	Gardening – formal garden, informal garden, vegetable garden, landscaped layout designing – formation and maintenance of lawn.
IV	Nursery structures – Green house – Shade house, Mist chamber – Topiary, Bonsai culture.
V	Manures, composting – vermicomposting.
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. Amarnath V. 2006. Nursery and Landscaping, M/s IBD Publishers, New Delhi. 2. Butts, E and Stensson, K. 2012. Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd. 3. Russell, T. 2012. Nature Guide: Trees: The world in your hands(Nature Guides). Mukherjee D. Gardening in India, Oxford IBH publishing co, New Delhi. 4. Kumar, N. 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. 5. Butts, E. and Stensson, K. 2012.Sheridan Nurseries: One hundred years of People,Plans, and Plants. Dundurn Group Ltd.
Reference Books	1.Edmond Musser and Andres, Fundamentals of Horticulture, McGraw Hill Book Co. New Delhi. 2. Agrawal, P.K. 1993. Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi. 3. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co.,San Francisco, USA. Singh, J. 2018. Fundamentals of Horticulture. Kalyani Publishers. Sharma V. K. 1999. Encyclopaedia of Practical Horticulture, Vol I –IV, Deep And Deep Publ. Pvt. Ltd.
Web Resources	1. https://www.kopykitab.com/higher-education-ebooks/higher-education-ebooks/Agricultural-Industry-agriculture-eBooks/Nursery-And-Landscaping-by-V-Amarnath 2. https://www.amazon.in/Nursery-Landscaping-Veena-

	Amarnath/dp/8177542788 3. https://www.amazon.in/Gardening/b?ie=UTF8&node=1637077031 4. https://in.pinterest.com/pin/496733033900458021/?lp=true 5. https://www.gardenvisit.com/ebooks

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2	1	2	2	1	3
CO 2	3	3	2	2	3	3	2	2	2	2
CO 3	2	2	3	1	1	1	1	3	3	1
CO 4	3	2	2	1	3	2	1	3	2	1
CO 5	3	3	2	3	2	1	2	3	2	3

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

FOUNDATION COURSE

Course Code	U23BOF11	ETHNO BOTANY AND ETHNOPHARMACOGNOSY	L	T	P	C
			2	-	-	2

Cognitive Level	K1: Recall K2: Understand K3: Apply
Learning objective	• To attain knowledge about ethnobotany and its significance • To understand the concept of traditional medicinal practices by Indian tribals • To know the value of ethnopharmacognosy • To apply the methods to transform ethnobotanical knowledge for the preparation of value added products
Unit I	**Ethnobotany**
Concept, scope and importance of ethno botany - sub-disciplines, inter- disciplines of ethnobotany, approaches in ethnobotanical studies.	
Unit II	**Ethnobotany and conservation of plants**
with special reference to India –conservation of selected plant species: sacred groves, forestry and unique ecosystems and their ethnobiolgical values.	
Unit III	**Tribes**
Major tribes of South India and their ethnobotanical and ethno-biological heritage – Parayar, Kurichiar, Paniyar, Karuman, Naikas, Shola Naikas, Thodas, Kothas, Kurumbas, Irullas, Kattu Naikas.	
Unit IV	**Tribal medicinal plants**
Plants used by tribals of Nilgiris, plants used by tribals of Kerala and Eastern Himalayas. Economic potential of NTFPs, Gender role in harvesting NTFPs, Good sustainable harvesting practice of some selected NTFPs.	
Unit V	**Ethnopharmacognosy**
Scope and importance of ethnopharmacognosy - Natural Plant Products – values of natural plant products – History of natural drugs. Plant with anti -tumor potential – Plant with anti- HIV potential – Plants with anti- inflammatory activity – Plants with anti- diabetic activity.	
Text books	1. Gokhale, S.B., Kokate, C.K. and Gokhale, A. Pharmacognosy of Traditional Drugs. 1st ed. Nirali Prakashan, Pune. 2016. 2. Gringauz. Introduction to Medicinal Chemistry: How Drugs Act & Why? Wiley India Pvt Ltd., Noida. 2012 3. Joshi, S.G. Medicinal Plants. Oxford & IBH Publishing C., Pvt., Ltd., 4. New Delhi. 2018.
Reference books	1. Kumar, N. A Textbook of Pharmacognosy. Aitbs Publishers, India. 2018. 2. Premendra Singh Medicinal Plants: Conservation, Cultivation and Utilization. Daya Publishing House New Delhi.2013.

<table>
<tr><td><u>E-References</u></td><td colspan="3">1. https://www.researchgate.net/publication/310772096_Ethnobotany_Ethnopharmacology_Bioprospectingand_Patenting
2. https://www.eolss.net/sample-chapters/C06/E6-151-02.pdf</td></tr>
<tr><td rowspan="3">Course outcome</td><td colspan="3">Upon completion of this course, the students will be able to</td></tr>
<tr><td>CO</td><td>Course Outcomes</td><td>Knowledge Level</td></tr>
<tr><td>CO1</td><td>comprehend the concept of ethnobotany and its related research</td><td>K2</td></tr>
</table>

SKILL ENHANCEMENT COURSE

BOTANICAL GARDEN AND LANDSCAPING

Title of the Course	**BOTANICAL GARDEN AND LANDSCAPING**						
Paper Number	Skill Enhancement-3						
Category		**Year**	I	**Credits**	2	**Course Code**	**U23BOS31**
		Semester	II				
Instructional Hours per week	**Lecture**		**Tutorial**		**Lab Practice**	**Total**	
	2		-		-	2	
Pre-requisite	Students should know about the fundamental concepts of gardening and landscaping.						
earning Objectives							
C1	To know about the fundamental concepts of gardening and landscaping.						
C2	To provide an overview of various gardening styles and its scope in recreation and bio-aesthetic planning.						
C3	To illustrate the significance of garden adornments and propagation structures.						
C4	To inculcate entrepreneurial skills in students for creative landscaping design using CAD software.						
C5	To create the design outdoor and indoor gardens and inculcate entrepreneurial skills for landscaping.						
Course outcomes: On completion of this course, the students will be able to: CO	**Programme Outcomes**						
. Recognize fundamental concepts of gardening and landscaping.	K1						
. Explain about significance of garden adornments and propagation structures.	K2						
. Apply	K3						

techniques of landscaping for aesthetic purposes and gardening for recreation.	& K6
. Distinguish between formal, informal and free style gardens and their applications.	K4
. Develop and design outdoor and indoor gardens and inculcate entrepreneurial skills for landscaping.	K5 & K6

UNIT	CONTENTS
I	Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Greenhouse. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents.
II	Flower arrangement: importance, production EXPERIMENTS and cultural operations, constraints, postharvest practices. Bioaesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.
III	Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Landscape designs, Styles of garden, formal, informal and free style gardens, types of gardens, Urban landscaping, Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, damsites, IT parks, corporate.
IV	Establishment and maintenance, special types of gardens, Bio-aesthetic planning, ecotourism, theme parks, indoor gardening, therapeutic gardening, non-plant components, water scaping, xeriscaping, hardscaping.
V	Computer Aided Designing (CAD) for outdoor and indoorscaping Exposure to CAD (Computer Aided Designing).
Extended Professional	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved

Component (is a part of internal component only, Not to be included in the External Examination question paper)	(To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
ecommended Texts	1. Acquaah, J. 2009. Horticulture – principles and practices, 4th edition, PHI learning Pvt. Ltd. 2. Rao Manibhushan K. 1991. Textbook of horticulture. MaC Millan India Ltd. 3. Gangulee H. C. and Kar A. K. 2004. College Botany Vol II, New Central Book Agency 4. Sharma V. K. 1999. Encyclopaedia of Practical Horticulture, Vol I –IV, Deep And Deep Publ. Pvt. Ltd. 5. Singh, J. 2018. Fundamentals of Horticulture. Kalyani Publishers.
eference Books	1. Berry, F. and Kress, J. 1991. Heliconia: An Identification Guide . Smithsonian Books. 2. Butts, E. and Stensson, K. 2012.Sheridan Nurseries: One hundred years of People,Plans, and Plants. Dundurn Group Ltd. 3. Russell, T. 2012. Nature Guide: Trees: The world in your hands(Nature Guides). 4. Acquaah, J. 2009. Horticulture – principles and practices, 4th edition, PHI learning Pvt. Ltd. 5. Edment Senn Andrews. 1994. Fundamentals of Horticulture.Tata. McGraw Hill Publishing Co., Ltd., Delhi.
eb resources	1. https://www.amazon.in/Gardening-Landscape-Design-and-Botanical-Garden/s?rh=n%3A1318122031%2Cp_27%3Aand+Botanical+Garden 2. https://www.overdrive.com/subjects/gardening 3. https://www.scribd.com/book/530538456/Opportunities-in-Landscape-Architecture-Botanical-Gardens-and-Arboreta-Careers 4. https://www.scribd.com/book/305542619/Botanic-Gardens 5. https://www.overdrive.com/subjects/gardening

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	1	2	3	1
CO 2	3	3	2	2	1	3	2	3	3	2
CO 3	2	2	3	2	1	2	1	3	2	3
CO 4	3	3	2	3	1	2	3	3	3	2
CO 5	3	3	2	3	2	3	1	3	3	2

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