VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

ELAYAMPALAYAM, THIRUCHENGODE (Tk), NAMAKKAL (Dt) - 637 205

(Affiliated to Periyar University, Approved by AICTE and Re-Accredited with "A" by NAAC)

DEPARTMENT OF BOTANY

BACHELOR OF SCIENCE

SYLLABUS AND REGULATIONS

CANDIDATES ADMITTED FROM 2020 - 2021

ONWARDS UNDER OBE AND CBCS PATTERN

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

ANGAMMAL EDUCATIONAL TRUST

ELAYAMPALAYAM, THIRUCHENGODE (Tk), NAMAKKAL (Dt) - 637 205

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B.Sc., Botany – Branch V

Vision:

- To imparting skills and values for the women graduates through innovative teaching, learning and research in plant science to meet the needs of youth and national demand.

Mission:

- To create demand for Botany.
- Strengthen the Department by research.
- To provide quality education through field study and projects, laboratory courses and entrepreneurial skills in Botany to achieve their diligence.
- To raise the students high academic caliber to meet the requirements of industries through productive research in various fields of Botany.
- To enhance opportunities to the rural women students for their successful career.

Programme Educational Objectives (PEOs):

1. To enhance opportunities the rural women students in entrepreneurial ventures for their successful career.
2. To provide skills for students through laboratory courses, projects and entrepreneurial skills in Botany to achieve their diligence.
3. To bring awareness about environmental issues and challenges among the students for sustainable development.

Programme Specific Objectives (PSOs)

1. To impart skills and values for the women graduates through innovative teaching, learning and research in Botany to meet the needs of youth and national demand.
2. To raise the students for high academic calibre to meet the requirement of industries through productive research in various fields of Botany.
3. To promote students with leadership quality to organize conferences, seminars, guest lectures and promote research based projects, to undergo field projects in the emerging areas of plant science.

Programme Outcomes (PO's)

POs	OUTCOME	CPD
PO-1	Students shall develop the ability of understanding the basic concepts and inter relating them within diverse life science domains for developing competitive skill metrics (CSM's).	K2
PO-2	Students shall able to comprehend the assorted knowledge of various streams of life science by revealing their views and suggestions with the impartment (or) exchange and explore in precise manner with life science professionals and public.	K1
PO-3	Students shall develop the capability of decisive/crucial thoughts by forming experimental ideas and assessing them to meet out specific competences and expectations in different biological sectors.	K3
PO-4	Students shall able to explain by effectively observing the condition and challenges existing in different biological systems.	K4
PO-5	Students shall perform well consistently by evaluating various challenges, arguments and ending up with right and accurate decision by integrating clinical, immunological, pharmaceutical domains.	K5
PO-6	Students shall able to define problems, formulate & test the hypotheses, analyse and interpret the data related to plant, animal, microbial and biochemical systems.	K4
PO-7	Students shall map out the tasks of fellow mates, directing them to formulate the vision of life science by improvising their managerial skill set.	K5
PO-8	Students shall develop the ability to explain and conclude by critically exploring the views and ideas with qualitative and quantitative biological data for developing logical and convincing arguments.	K4
PO-9	Students shall develop an acute perception of a situation and knowledge values of multiple domains of life science with the capability of effective engagement in a multicultural society.	K2
PO-10	Students shall able to work effectively and access the utility of ICT with biologically diversified teams with assistance, especially by complying readily and effectively use the relevant information resources for the knowledge.	K3
PO-11	Students shall develop the habit of individual working environment and able to promote confidence level for executing, managing and completing a biological assignment with effective and reproducible solutions.	K6
PO-12	Students shall able to meet out their own learning needs by appreciating environment and sustainability from a range of current research and	K5

	development in all aspects of work.	
PO-13	Students shall develop the habit of avoiding unethical behavior in terms of misinterpretation of project/research data derived, committing plagiarism, non-adherence of Intellectual Property Rights that are related to product development and marketing.	K5
PO-14	Students shall apply the knowledge of basic life science and its specific transferable skills for identifying the issues and solving them with well defined solutions.	K6
PO-15	Students shall able to acquire knowledge and technical skill set throughout their life by developing execution skills that meet outs the social, economic and cultural objectives which are relevant to life science related job trades.	K6

For Candidates Admitted from 2020 – 2021 Onwards Under OBE and CBCS Pattern:

1. Scope of the course:

Botany is a classical science dealing with not merely the morphology of plants but also their functional aspects and economic importance. Further, the study helps us to understand the role of plants in maintaining the environment besides, saving as a renewable energy sources. Plants are most valuable in treating the ailments of mankind. It has several branches such as Plant Diversity, Plant Morphology, Taxonomy, Anatomy, Embryology, Plant Pathology, Plant Ecology, Ethnobotany, Genetics, Pant Biotechnology, Plant Physiology, Biochemistry, Horticulture, Medicinal Plants, Biofertilizers, etc., besides serving as the basis for several other biosciences. It is a basic science with several research disciplines like modern transgenic biology.

2. Objectives of the course

This course enables the students

- To gain knowledge of the importance of plants in sustaining life on earth.
- To acquire skills in drawing by actual observation at its original and natural condition.
- To know the nutritive value of food and maintain 'Health Care Problems'.
- To create awareness in understanding the extinction plants.
- To create awareness of natural resources and methods of conservation.
- To create environmental awareness to overcome pollution.
- To develop skills in growing various horticultural plants and horticultural techniques thereby to raise a nursery.
- To motivate self-employment by knowledging and practicing in the preparation of biofertilizers.
- 'Earn while learn' can be done with the acquirement of basic knowledge in growing some medicinal plants & mushrooms.

- To gain knowledge for exploration of new plants their unknown values and unknown values of known plants.
- To gain a knowledge for the techniques of producing desirable plants through the study of molecular biology and genetic engineering.
- The syllabus content is mainly revised based on the Teachers Recruitment Board Syllabus.

3. Conditions for Admission:

A candidate who has passed Higher Secondary Examination in academic or vocational stream with Botany under Higher Secondary Board of Examinations, Tamil Nadu or an examination accepted as equivalent there to or as per norms said by the Government of Tamil Nadu are permitted to appear and qualify for B. Sc., Degree examination of this university after a course of study of three academic years.

4. Duration of the Course:

The course for the degree of Bachelor of Science in Botany shall consist of three academic years divided into six semesters.

5. Course of Study:

The course of study shall comprise of instruction in the following subjects according to the syllabus and books prescribed from time to time.

Semester I

1. Foundation Tamil/Anyone of modern or classical language - I
2. Foundation English - I
3. Core Course I – Plant Diversity –I
4. Core Course II - Practical - I
5. First Allied – Allied Zoology - I
6. First Allied II – Practical - I
7. Value Education - Yoga

Semester II

8. Foundation Tamil/Anyone of modern or classical language – II
9. Foundation English - II
10. Core Course III – Plant Diversity -II
11. Core Course IV- Practical –II
12. First Allied - II – Allied Zoology - II
13. First Allied Zoology Practical - II
14. Value Education – Environmental Studies

Semester III

15. Foundation Tamil/Anyone of modern or classical language - III
16. Foundation English - III
17. Core Course V – Mushroom Cultivation Technology
18. Core Course VI – Practical - III
19. Second Allied – Allied Chemistry - I
20. Skill Based Elective Course - I – Horticulture and Nursery Management/Environmental Biotechnology
21. Non Major Elective Course - I

Semester IV

22. Foundation Tamil - IV/Anyone of modern or classical language - IV
23. Foundation English - IV
24. Core Course VII - Anatomy, Embryology and Seed Science
25. Core Course VIII - Practical - IV
26. Second Allied II – Allied Chemistry -II
27. Second Allied Chemistry Practical -I
28. Skill Based Elective Course - II – Fundamentals of Microbiology and Plant Pathology/Industrial Botany
29. Non Major Elective Course - II

Semester V

30. Core Course IX – Morphology and Taxonomy of Angiosperms.
31. Core Course X - Cell Biology and Genetics
32. Core Course XI – Plant Biotechnology, Microscopy and Microtechnique
33. Core Course - XII – Practical -V
34. Elective I - Plant Breeding and Evolution/Forest Botany

Semester VI

35. Core Course XIII - Plant Physiology and Biochemistry
36. Core Course XIV – Plant Ecology, Phytogeography and Conservation Biology
37. Core Course XV - Group Project (Minor)
38. Core Course XVI - Practical VI
39. Elective II - Ethnobotany, Medicinal Plants and their Utilization/Biofertilizers
40. Extension Activities

6. Examination:

The theory and practical examination shall be of three hours duration to each paper at the end of the semester. The candidates failed in any subject will be permitted to appear for each failed subject or subjects in the subsequent examination. However in the final semester examination if the failure one or two subjects they can appear for a supplementary exam within a month.

The examination consists of Continuous Internal Assessment (CIA) and External Assessment (EA).

Internal Assessment Marks for Theory papers are as follows

Attendance - 5 Marks
Assignment - 5 Marks
CIA – I and II Test - 5 Marks
Model Examinations - 10 Marks
Total - 25 Marks

Internal Assessment Marks for Theory papers are as follows

Attendance - 10 Marks
Observation Note - 10 Marks
Model Examinations - 20 Marks
Total - 40 Marks

7. Distribution of Marks for Attendance:

Percentage	Marks	
	Theory	Practical
75 - 80	1	2
81 - 85	2	4
86 - 90	3	6
91 - 95	4	8
96 - 100	5	10

Note:

Minimum 75 % of attendance is compulsory to sit for the exam. A Condonation can be permitted between 65 % and 74.9 %.

8. Scheme of Examination:

The scheme of Examinations for different semesters shall be as follows

B.Sc., Botany – Outcome Based Education
(For the candidates admitted from the Academic year 2020 - 2021 Onwards)

Semester	Part	Course	Code	Title	Inst. Hrs.	Credits	Exam Hrs.	Marks		
								CIA	EA	Total
I	I	Tamil I	20U1LT01/ 20U1LM01/ 20U1LH01	Foundation Tamil/Anyone Modern or Classical language - I	6	3	3	25	75	100
	II	English I	20U1LE01	Foundation English - I	6	3	3	25	75	100
	III	Core Course I	20U1BOC01	Plant diversity –I (Algae, Fungi and Lichens)	5	5	3	25	75	100
		Core Course II (Practical)	20U1BOCP01	Algae, Fungi and Lichens	3	3	3	40	60	100
		First Allied I	20U1ZOA01	Allied Zoology - I	5	4	3	25	75	100
		First Allied II (Practical)	20U2ZOAP01	Allied Zoology Practical - I	3	3	3	40	60	100
	IV	Value Based Education	20U1VE01	Yoga	2	2	3	25	75	100
				Total	**30**	**23**	**-**	**205**	**495**	**700**
II	I	Tamil II	20U2LT02/ 20U2LM02/ 20U2LH02	Foundation Tamil/Anyone Modern or Classical language - II	6	3	3	25	75	100
	II	English II	20U2LE02	Foundation English - II	6	3	3	25	75	100
	III	Core Course III	20U2BOC02	Plant diversity – II (Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)	5	5	3	25	75	100
		Core Course IV (Practical)	20U2BOCP02	Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany	3	3	3	40	60	100
		First Allied III	20U2ZOA02	Zoology II	4	4	3	25	75	100
		First Allied II (Practical)	20U2ZOAP02	Allied Zoology Practical - II	3	3	3	40	60	100
	IV	Value Based Education	20U2ES01	Environmental Studies	3	4	3	25	75	100
				Total	**30**	**25**	**-**	**205**	**495**	**700**

III	I	Tamil III	20U3LT03 20U3LM03 20U3LH03	Foundation Tamil III/Anyone Modern or Classical language - III	6	3	3	25	75	100
	II	English III	20U3LE03	Foundation English III	6	3	3	25	75	100
	III	Core Course V	20U3BOC03	Mushroom cultivation Technology	6	5	3	25	75	100
		Core Course V I (Practical)	20U3BOCP03	Mushroom cultivation Technology	3	3	3	40	60	100
		Second Allied I	20U3CHA01	Chemistry I	5	4	3	25	75	100
		Second Allied II Practical	20U4CHAP01	Chemistry Practical I	-	-	-	-	-	-
	IV	SBEC I	20U3BOS01A/B	Elected by students	2	2	3	25	75	100
		NMEC I	20U3BON01	Elected by students	2	2	3	25	75	100
				Total	**30**	**22**	**-**	**190**	**510**	**700**
IV	I	Tamil IV	20U4LT04	Foundation Tamil IV	6	3	3	25	75	100
	II	English IV	20U4LE04	Foundation English IV	6	3	3	25	75	100
	III	Core Course VII	20U4BOC04	Anatomy, Embryology and Seed Science	4	5	3	25	75	100
		Core Course VIII (Practical)	20U4BOCP04	Anatomy, Embryology and Seed Science	3	3	3	40	60	100
		Second Allied III	20U4CHA02	Chemistry II	4	4	3	25	75	100
		Second Allied II Practical	20U4CHAP01	Allied Chemistry Practical - I	3	3	3	40	60	100
	IV	SBEC II	20U4BOS02A/B	Elected by students	2	2	3	25	75	100
		NMEC II	20U4BON02	Elected by students	2	2	3	25	75	100
				Total	**30**	**25**	**-**	**230**	**570**	**800**
V	III	Core Course IX	20U5BOC05	Morphology and Taxonomy of Angiosperms	6	5	3	25	75	100
		Core Course X	20U5BOC06	Cell Biology and Genetics	6	5	3	25	75	100
		Core Course XI	20U5BOC07	Plant Biotechnology, Microscopy and Microtechnique	6	5	3	25	75	100
		Core Course XII (Practical)	20U5BOCP05	Core Course IX, X and XI	8	4	3	40	60	100
		Elective I	20U5BOE01A/B	Elected by students	4	3	3	25	75	100
				Total	**30**	**22**	**-**	**140**	**360**	**500**
VI	III	Core Course XIII	20U6BOC08	Plant Physiology and Biochemistry	6	5	3	25	75	100
		Core Course XIV	20U6BOC09	Plant Ecology, Phytogeography and Conservation Biology	6	5	3	25	75	100
		Core Course XV	20U6BOCP06	Core Course XIII and XIV	6	4	3	40	60	100

	Core Course XVI	20U6BOPR01	Group project	7	5	3	40	60	100
	Elective II	20U6BOE02A/B	Elected by students	5	3	3	25	75	100
	Extension Activities	20U6EX01	-	-	1	-	-	-	-
			Total	**30**	**23**	**-**	**155**	**345**	**500**
			Total number of hours, credits and marks	**180**	**140**	**-**	**1125**	**2775**	**3900**

Skill Based Elective Course

Semester - III

1. Horticulture and Nursery Management
2. Environmental Biotechnology

Semester – IV

1. Fundamentals of Microbiology and Plant Pathology
2. Industrial Botany

Non Major Elective Courses:

1. Mushroom Cultivation (20U3BON01)
2. Herbal Botany (20U4BON02)

Major Elective Courses:

Semester – V

1. Plant Breeding and Evolution
2. Forest Botany

Semester – VI

1. Ethnobotany, Medicinal Plants and their Utilization
2. Biofertilizers

Question Paper Pattern for B. Sc., Botany Course

Time: 3 Hrs **Max. Marks: 75**

PART – A (20 x 1 = 20 Marks)
(*Answer all questions*)
(Multiple Choice Questions - Four questions from each unit)

PART – B (5 x 5 = 25 Marks)
(*Answer all questions*)
(One question from each unit with internal choice)

PART – C (3 x 10 = 30 Marks)
(*Answer any three questions)*
(One question from each unit)

9. Format to be followed in dissertation

The formats/certificate for dissertation to be submitted by the students are given below:

1) Format for the preparation of project work

(a) Title page

(b) Bonafide certificate

(c) Acknowledgement

(d) Table of contents

Contents

Format of the title Page

TITLE OF THE DISSERTATION

Dissertation Submitted in partial fulfillment of the

requirement for the award of the Degree of

Bachelor of Science in Botany

to the Periyar University, Salem 636 011

By

Student Name

Register Number

Under the Guidance of

Guide Name

College / University Department

Year

Format of the Certificate

CERTIFICATE

This is to certify that the dissertation entitled …….(title of the dissertation)…..submitted by ……. (name of the candidate)…. in partial fulfillment of the requirement of the degree of Master of Science in Botany to the Periyar University, Salem is a bonafide record of independent research work done by her during the period …. (Year)… of her study in the Department of Botany at Vivekanandha College of Arts and Sciences for Women, Elayampalayam, under my supervision and guidance. This dissertation has not formed the basis for the award of any Degree, Diploma, similar titles or associate ship to any candidates of this University.

Viva –Voce Examination Date:

Signature of Head Signature of the Guide

Examiners: 1.

2.

10. Passing Minimum:

The Candidate shall be declared to have passed the examination if the candidate secures not less than 30 marks out of 75 marks in each theory paper. There is no passing minimum for internal assessment. For the practical paper, a minimum of 24 marks out of 60 marks in the practical examination and the record notebook taken together. There is no passing minimum for internal assessment and record note book. However submission of a record note book is a must.

For the project work and viva – voce the candidate should secure 24 marks out of 60 marks for pass. There is no passing minimum for internal assessment. The candidate should compulsorily attend viva-voce examination to secure pass in that paper. Candidate who does not obtain the required minimum marks for a pass in a paper/project report shall be required to appear and pass the same at a subsequent appearance.

11. Classification of successful candidates

Candidates who secure not less than **60%** of the aggregate marks in the whole examination shall be declared to have passed the examination in **first class**. All other successful candidates shall be declared to have passed in the **second class**.

Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in **first class with distinction** provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of three academic years from the year of admission to the course only are eligible for **Autonomous Ranking**.

12. Maximum duration for the completion of the UG Programme

The maximum duration for completion of the UG Programme shall not exceed 6 semesters.

13. Commencement of this Regulation

These regulations shall take effect from the academic year 2020-21, i e., for students who are to be admitted to the first year of the course during the academic year 2020-21 and thereafter.

14. Transitory Provision

Candidates who were admitted to the UG course of study before 2020-21 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2020. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

SEMESTER I

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U1BOC01	Title	Batch	2020 -2023
Hours/Week	5	Plant Diversity - I	Semester	I
			Credits	05

Course Objective

To study the general characters, classification, thallus structure, reproduction, life cycle and economic importance of algae, fungi and lichens.

Course Outcomes (CO)

K1	CO1	To remember the salient features of algae, fungi and lichens.
K2	CO2	To understand the various trends of classification of algae, fungi and lichens.
K3	CO3	The application of algae, fungi and lichens for the production of various industrial based products.
K4	CO4	To analyze the thallus organization of thallophytes.
K5	CO5	Evaluation of various modes of reproduction of algae, fungi and lichens.

Algae

Unit - I **(12 Hours)**

General characters, thallus organisation, reproduction and life cycle patterns of algae. Outline classification of algae by F. E. Fritsch (1935). Economic importance of algae with special reference to the production of Agar Agar, Carrageenin and Algal Biofertilizer (BGA). Algae as indicators of pollution.

Unit - II **(12 Hours)**

Study of the structure, reproduction and lifecycles of the following genera: *Nostoc, Chlamydomonas, Oedogonium, Caulerpa*, *Dictyota* and *Polysiphonia*.

Fungi

Unit - III **(12 Hours)**

General characters of fungi. Outline classification of fungi by Alexopoules and Mims, (1979). A systematic study of the range of structure, reproduction, life cycles and economic importance of fungi with reference to application of *Saccharomyces* and *Penicillium* in industries.

Unit - IV **(12 Hours)**

A study on the occurrence, structure, reproduction and life cycles of the following genera – *Albugo, Saccharomyces, Penicillium, Puccinia* and *Cercospora.*

Unit - V

Lichens **(12 Hours)**

General characters, occurrence, classification, structure, reproduction and economic importance of lichens.

Text Book:

1.O. P. Sharma. 2011. Text Book of Algae. Tata McGraw-Hill Publications, New Delhi.

Reference Books:

1. C. J. Alexopoulos, C. W. Mims. 2007. Introductory Mycology. M. Blackwell. John Wiley, New York.
2. Srivastava J. P. 1970. An Introduction to Fungi. Central book Depot, Allahabad.
3. Sohan Sharma. 2012. Advances in Mycology. Random Publications Publishers and Distributors, New Delhi.
4. Vashishta B. R., Sinha A. K. and Singh V. P. 2010. Botany for Degree students – Algae. S. Chand and Company, New Delhi.
5. Mishra A. and Agarwal R. P. 1970. Lichens - A Preliminary Text Book. Oxford and IBH Publishing Company, Mumbai.

Web References:

1. https://www.biologydiscussion.com/botany/lichens-botany/lichens-meaning-habitat-reproduction-economic-importance-resynthesis-fungi-biology/86043
2. http://universityofladakh.org.in/file1/Botany%20Sem%201b.pdf
3. https://www.biologydiscussion.com/algae/algae-characters-and-economic-importance-plant-kingdom/52154

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Core Practical

For students admitted from the academic year 2020 – 2021

Core Major Practical I (Core Course II) 20U1BOCP01

Plant Diversity-I (Algae, Fungi and Lichens)

Algae:

1. Study the vegetative and reproductive structures of *Nostoc, Chlamydomonas, Oedogonium, Caulerpa, Dictyota* and *Polysiphonia.*

2. Economic importance of algae with special reference to production of Agar Agar, Carrageenin and Algal Biofertilizers (BGA).

Fungi:

1. Study the vegetative and reproductive structures of *Albugo, Saccharomyces, Penicillium, Puccinia* and *Cercospora*.

2. Economic importance of fungi with reference to application of Yeast and *Penicillium* in industries.

Lichens:

1. Study the morphology and internal structure of lichens.

Field Visit:

Botanical tour for minimum of one day to acquire knowledge on Plant Diversity – I.

Core Practical

Model Question Paper B.Sc., Botany Degree Examination

For Students Admitted from the academic year 2020 – 2021

Core Major Practical - I (For Core Course I)

Plant Diversity - I

(Paper code: 20U1BOCP01)

(Algae, Fungi and Lichens)

Time: 3 Hrs. **Maximum : 60 Marks**

Practical : 50 Marks

Record : 10 Marks

1. Perform the micropreparations for the given specimen **A** and **B.** **(8×2=16)**

(Identification – 1, Slide – 2, Reasons – 3 and Diagram – 2)

2. Comment on **C, D** and **E**. **(5×3=15)**

(Identification – 2, Notes – 2 and Diagram – 1)

3. Mention the Genus, Group and Morphology of given specimen **F, G** and **H.** **(5×3=15)**

(Genus – 2, Group – 1 and Morphology – 2)

4. Writes notes on the economic importance of **I**. **(4×1=4)**

(Sources – 2 and Uses – 2)

Key:

1. Sectioning:

A – Algae

B – Fungi

2. Spotters - Permanent slides

C – Algae

D – Fungi

E – Lichens

3. Spotters – Morphology

F– Algae

G – Fungi

H – Lichens

4. Spotters – Economic importance

I - Algae or Fungi

SEMESTER I

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology and Chemistry)	
Course Code	20U1BOA01/20U3BOA01	Title	Batch	2020 -2021
Hours/Week	5	Allied Botany – I	Semester	I
			Credits	04

Course Objectives

- To study the general characters, thallus structure, reproduction, life cycle economic importance of algae and fungi.
- To study the morphology, internal structure, reproduction and life cycle of *Riccia*, *Lycopodium* and *Cycas*.
- To study the absorption of water, photosynthesis and respiration.
- To study the climatic factors, morphological and anatomical adaptations of hydrophytes and xerophytes.

Course Outcomes (CO)

K1	CO1	To remember the general characters of algae and fungi.
K2	CO2	To understand structure, reproduction and life cycle of lower group of plants.
K3	CO3	To apply the economic importance of algae and fungi.
K4	CO4	To analyze metabolic reactions in plants.
K5	CO5	Evaluation the morphological and anatomical adaptations of hydrophytes and xerophytes.

Unit - I **(12 Hours)**

Thallophytes

Algae

General characters of algae. Study on the thallus structure, reproduction and life cycle of the following genera- *Nostoc, Oedogonium* and *Polysiphonia*. Economic importance of algae with reference to food and industry.

Unit - II **(12 Hours)**

Fungi

General characters of fungi. Study on the thallus structure, reproduction and life cycle of the following genera- *Albugo, Penicillium* and *Agaricus*. Economic importance of fungi.

Unit - III **(12 Hours)**

Bryophytes, Pteridophytes and Gymnosperms:

Study on the structure, reproduction and life cycle of the following genera- *Riccia, Lycopodium* and *Cycas*.

Unit - IV **(12 Hours)**

Plant physiology

Absorption of water (Active and Passive). Photosynthesis – Light reaction (Cyclic and non-cyclic phosphorylation) and Calvin cycle. Respiration – Aerobic respiration – Glycolysis and Kreb's cycle. Transpiration and its types (Stomatal transpiration).

Unit - V **(12 Hours)**

Plant ecology

Factors affecting vegetation – Climatic, Edaphic and Biotic factors, morphological and anatomical adaptations in hydrophytes and xerophytes.

Text Book:

1. Pandey, S. N., Mishra, S. P. and Trivedi, P. S. 2009. Text book of Botany Volume- II. Vikas Publishing House Private Limited, New Delhi.

Reference books:

1. Vashishta, P. C., Sinha. A. and Anil Kumar. 2009. Botany for Degree Students,- Pteridophyta. S. Chand and Company Private Limited, New Delhi.
2. Vashishta B. R. 1983. Botany for Degree student – Bryophyta. S. Chand and Company Private Limited, New Delhi.
3. Smith, G.M. 1935. Cryptogamic Botany. Vol. – III. Tata McGraw Hill Publishing Company, New Delhi.
4. Sporne. K. R. 1991. The Morphology of Gymnosperms. B.I. Publications Private Limited, Mumbai.
5. Rashid, A. 1979. An Introduction to Pteridophyta. Vikas Publishing House, New Delhi.

Web References:

1. https://www.biologydiscussion.com/botany/lichens-botany/lichens-meaning-habitat-reproduction-economic-importance-resynthesis-fungi-biology/86043
2. https://www.biologydiscussion.com/gymnosperm/cycas-distribution-morphology-and-reproduction-cycadales/22280
3. https://photosynthesiseducation.com/photosynthesis-and-cellular-respiration

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Practical Syllabus B.Sc., (Allied Botany) Degree Examination

For Students Admitted from the academic year 2020 – 2021

First Allied Practical - I (For Allied Course I)

Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms:

Study the vegetative and reproductive organs of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms prescribed in the syllabus.

Plant physiology:

Experimental setup – Respiroscope and Wilmott's bubbler.

Plant Ecology:

Anatomy of T. S. of *Hydrilla* stem and T. S. of *Nerium* leaf.

Allied Botany Practical

Model Practical Question Paper B.Sc., Allied Botany - Examination

For Students Admitted from the academic year 2020 – 2021

First Allied Practical I (For Allied Course I)
20U1BOAP01/20U3BOAP01

Time: 3 Hrs. **Maximum: 60 Marks**
Practical : 50 Marks
Record : 10 Marks

1. Perform the micropreparations for the given specimen **A** and **B.** **(8×2=16)**

(Identification – 1, Slide – 2, Reasons – 3 and Diagram – 2)

2. Comment on **C, D** and **E**. **(4×3=12)**

(Identification – 1, Reasons – 2 and Diagram – 1)

3. Mention the Genus, Group and Morphology of given specimen **F, G** and **H.** **(4×3=12)**

(Genus – 1, Group – 1 and Morphology – 2)

4. Comment on setup **I.** **(6×1=6)**

(Aim – 1, Materials required – 1, Procedure – 2, Diagram – 1 and Result – 1)

5. Writes notes on the economic importance of **J**. **(4×1=4)**

(Sources – 2 and Uses – 2)

Key:

1. Sectioning:

A – Pteridophytes
B – Gymnosperms

2. Spotters - Permanent slides

C – Algae or Fungi
D – Bryophytes
E – Plant Ecology

3. Spotters – Morphology

F – Algae
G – Fungi
H – Bryophytes

4. Physiology experimental setup:

I– Physiology Experiment.

5. Spotters – Economic importance

J - Algae or Fungi

SEMESTER II

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U2BOC02	Title	Batch	2020 -2023
Hours/Week	5	Plant Diversity - II	Semester	II
			Credits	05

Course Objective

To study the general characters, classification, structure, reproduction and life cycle of bryophytes, pteridophytes and gymnosperms.

Course Outcomes (CO)

K1	CO1	To remember salient features of bryophytes, pteridophytes and gymnosperms.
K2	CO2	To understand the internal structures and life cycle patterns of bryophytes, pteridophytes and gymnosperms.
K3	CO3	Application of economic importance of bryophytes, pteridophytes and gymnosperms.
K4	CO4	To analyze the fossil and fossilization methods of pteridophytes and gymnosperms.
K5	CO5	To evaluate the stelar evolution and sporangial organization of pteridophytes.

Unit - I

Bryophytes **(12 Hours)**

General characters of bryophytes. Classification of bryophytes proposed by Rothmaler (1951). A detailed study of the structure, reproduction and life cycle of the following genera (Excluding developmental stages of sex organs and sporophyte). *Riccia*, *Anthoceros* and *Polytrichum*. Economic importance of bryophytes.

Unit - II

Pteridophytes **(8 Hours)**

General characters of Pteridophytes. Classification of Pteridophytes proposed by Reimer (1954). Life cycle of Pteridophytes. Stelar evolution in Pteridophytes. Sporangial organization - Homospory and Heterospory. Apospory and Apogamy. Economic importance of Pteridophytes.

Unit - III **(16 Hours)**

A detailed study of the morphology, anatomy, reproduction and life cycle of the following genera: *Lycopodium, Selaginella, Equisetum* and *Marsilea.*

Unit - IV

Gymnosperms **(18 Hours)**

General characters of Gymnosperms. Classification of gymnosperms proposed by Pilger and Melchior (1954). A detailed study of the morphology, anatomy, mode of reproduction and life history of the following genera: *Cycas*, *Pinus* and *Gnetum*. Economic importance of gymnosperms.

Unit - V

Palaeobotany **(6 Hours)**

Fossils and fossilization. Geological time scale. Brief study of the following fossils - *Rhynia, Lepidodendron, Lepidocarpon, Calamites* and *Williamsonia.*

Text Book:

1. Pandey, S. N., Mishra, S. P. and Trivedi, P. S. 2009. Text book of Botany Volume- II. Vikas Publishing House Private Limited, New Delhi.

Reference Books:

1. Vashishta, P. C., Sinha. A. and Anil Kumar. 2009. Botany for Degree Students,- Pteridophyta. S. Chand and Company Private Limited, New Delhi.
2. Vashishta B. R. 1983. Botany for Degree student – Bryophyta. S. Chand and Company Private Limited, New Delhi.
3. Shukla, A.C. and Mishra, S. P. 1982. Essentials Palaeobotany, Vikas Publishing House Private Limited, New Delhi.
4. Smith, G.M. 1935. Cryptogamic Botany. Vol. – III. Tata McGraw Hill Publishing Company, New Delhi.
5. Sporne. K. R. 1991. The Morphology of Gymnosperms. B.I. Publications Private Limited, Mumbai.

Web References:

1. https://www.biologydiscussion.com/bryophyta/bryophyta-features-classification-and-economic-importance/5654
2. https://www.biologydiscussion.com/plants/plant-kingdom/pteridophytes-characters-and-economic-importance-plant-kingdom/52192
3. https://www.biologydiscussion.com/gymnosperm/gymnosperm-classification-and-economic-importance/5726

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Core Practical

For students admitted from the academic year 2020 – 2021

Core Major Practical II (Core Course III) 20U2BOCP02

Plant Diversity - II

(Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)

Bryophytes:

Study the vegetative and reproductive organs of *Riccia, Anthoceros* and *Polytrichum.*

Pteridophytes:

Study the vegetative and reproductive organs of *Lycopodium, Selaginella, Equisetum* and *Marsilea*.

Gymnosperms:

Study the vegetative and reproductive organs of *Cycas, Pinus* and *Gnetum*.

Palaeobotany:

Study of the fossil – *Rhynia, Lepidodendron, Lepidocarpon, Calamites* and *Williamsonia.*

Field Visit:

Botanical tour for minimum of one day to acquire knowledge on Plant Diversity – II.

Core Practical

Model Question Paper B.Sc., Botany Degree Examination

For Students Admitted from the academic year 2020 – 2021

Core Major Practical - II (For Core Course III)

Plant Diversity – II

(Paper code: 20U2BOCP02)

(Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)

Time: 3 Hrs. **Maximum: 60 Marks**

Practical : 50 Marks

Record : 10 Marks

1. Perform the micropreparations for the given specimen **A, B** and **C.** **(8×3=24)**

(Identification – 1, Slide – 2, Reasons – 3 and Diagram – 2)

2. Comment on **D, E** and **F**. **(4×3=12)**

(Identification – 1, Reasons – 2 and Diagram – 1)

3. Mention the Genus, Group and Morphology of given specimen **G**, **H** and **I.** **(4×3=12)**

(Genus – 1, Group – 1 and Morphology – 2)

4. Writes notes on **J**. **(2×1=2)**

(Diagram - 1 and Notes – 1)

Key:

1. Sectioning:

A – Bryophytes
B – Pteridophytes
C - Gymnosperms

2. Spotters - Permanent slides:

D – Bryophytes
E – Pteridophytes
F - Gymnosperms

3. Spotters – Morphology:

G – Bryophytes
H – Pteridophytes
I - Gymnosperms

4. Spotters:

J - Palaeobotany

SEMESTER II

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Chemistry and Zoology)	
Course Code	20U2BOA02	Title	Batch	2020 -2023
Hours/Week	5	Allied Botany - II	Semester	II
			Credits	04

Course Objective

- To study external morphology, taxonomy, anatomy and embryology of angiosperms.
- To study the cell organelles and their functions.
- To study Mendel's law.

Course Outcomes (CO)

K1	CO1	To obtain knowledge on the morphological features of angiosperms.
K2	CO2	Gaining knowledge on the classification of angiospermic plants.
K3	CO3	Familiarizing the technical aspects of anatomy, cytology and genetics.
K4	CO4	To analyze the reproductive structures of an angiospermic plant.
K5	CO5	To evaluate the internal structure of dicot and monocot plants.

Unit – I **(12 Hours)**

External morphology

Phyllotaxy. Types of leaf – simple and compound. Inflorescence – Racemose, Cymose and Special types (Head and Cyathium). Terminology with reference to flower description**.** Fruits and their types.

Unit – II **(12 Hours)**

Taxonomy

Bentham and Hookers system of classification. Study the following families and their economic importance: Annonaceae, Rubiaceae, Amaranthaceae, Lamiaceae and Poaceae.

Unit – III **(12 Hours)**

Cytology and Genetics

Cytology: Structure of plant cell and brief outline of the following cell organelles: Mitochondria, Chloroplast and Nucleus. Cell division: mitosis and meiosis. Genetics: Mendel's monohybrid and dihybrid cross. Back cross and Test cross.

Unit – IV **(12 Hours)**

Anatomy

Simple and permanent tissues: Parenchyma, Collenchyma and Sclerenchyma. Complex permanent tissues: Xylem and Phloem. Primary structure of dicot root and stem and monocot root and stem. Internal structure of dicot and monocot leaf.

Unit –V **(12 Hours)**

Embryology

Structure of anther. Structure and functions of Tapetum. Structure of male gametophyte. Types of ovule and female gametophyte (Polygonum type). Fertilization. Structure of mature embryo sac. Structure and development of dicot embryo (Capsella type – *Bursa pastoris*).

Text Book:

1. Pandey, B. P. 2011. Textbook of Botany: Angiosperms – Taxonomy, Anatomy, Embryology and Economic Botany. S. Chand and Company Private Limited, New Delhi.

Reference Books:

1. Bhojwani, S. S. and Bhatnagar, S. P. 2009. The Embryology of Angiosperms. Vikas Publishing House Private Limited, New Delhi.
2. Davis, P.H. and Heywood, V.M. 1965. Principles of Angiosperm Taxonomy. Oliver and Boyd, Edinburgh.
3. Pandey, B. P. 2001. Plant anatomy. S. Chand and Company Private Limited, New Delhi.
4. Sumitra Sen and Dipak Kumar Kar. 2006. Cytology and Genetics. Narosa Publishing House Private Limited, New Delhi.
5. Sundararajan, S. 2000. Cytogenetics. Anmol Publications Private Limited, New Delhi.

Web References:

1. https://www.biologydiscussion.com/plant-taxonomy/morphology-and-plant-taxon
2. https://www.askiitians.com/biology/anatomy-of-flowering-plants/internal-structure-of-stems-roots-and-leaves.htmlomy/30414
3. https://www.annualreviews.org/doi/abs/10.1146/annurev.genet.36.040102.131941

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Practical Syllabus B.Sc., (Allied Botany) Degree Examination

For Students Admitted from the academic year 2020 – 2021

First Allied Practical – II (For Allied Course III)

Morphology and Taxonomy:

To describe the salient features of families prescribed in the syllabus.

Economic Importance:

To identify the genus, family and morphology of the parts used for the following plant specimens

Annona – Fruit Black Gram – Seed
Tamarind – Fruit Sunflower – Seed
Cucumber – Fruit Areca – Nut
Dates – Fruit Cinchona – Bark
Green Gram –Seed Coconut – Kernel

Cytology:

Observation of cellular structures.

Genetics

To Study the Monohybrid, Dihybrid, Back cross and Test cross.

Anatomy:

Study the anatomical characters of dicot root and stem, monocot root and stem and dicot and monocot leaf.

Embryology:

Observation of T. S. of Anther and types of ovules.

Allied Botany Practical

Model Practical Question Paper B.Sc., Allied Botany – Examination

For Students Admitted from the academic year 2020 – 2021

First Allied Practical II (For Allied Course III)
20U2BOAP01/20U4BOAP02

Time: 3 Hrs. **Maximum: 60 Marks**
Practical : 50 Marks
Record : 10 Marks

1. Identify the specimen **A** and **B** to the respective families giving reasons. **(5×2=10)**

(Identification – 2 and Reasons - 3)

2. Mention the genus, family and morphology of the useful part of **C, D, E, F** and **G.** **(3×5=15)**

(Genus – 1, Family -1 and Morphology of useful part -1)

3. Take the transverse sections of given specimen **H** and **I.** **(8×2=16)**

(Identification – 1, Slide – 2, Reasons – 3 and Diagram – 2)

4. Write critical notes on **J, K** and **L.** **(3×3=9)**

(Identification -1, Notes – 1 and Diagram - 1)

Key:

1. Family Identification:

A and **B** – Any plants prescribed in the syllabus

2. Spotters – Economic Importance:

C, D, E, F and **G** – Prescribed in the syllabus

3. Sectioning:

H and **I –** Anatomy

4. Spotters:

J – Cytology

K – Genetics

L – Embryology

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U3BOC03	Title	Batch	2020 -2023
Hours/Week	5	Mushroom Cultivation Technology	Semester	III
			Credits	05

Course Objective

- To study the morphology of mushrooms, spawn and compost preparation and cultivation of button, oyster and straw mushroom.

Course Outcomes (CO)

K1	CO1	To remember the knowledge on morphology, habitats and differentiation of mushrooms.
K2	CO2	To understand compost preparation, spawn preparation and storage of spawn.
K3	CO3	Applying the cultivation of button, oyster and straw mushrooms.
K4	CO4	To analyze the marketing and nutrient profile of mushrooms.
K5	CO5	Evaluation of the facilities required for spawn preparation.

Unit - I **(12 Hours)**

Mushroom morphology: Different parts of a typical mushroom and variations in mushroom morphology. Medicinal mushrooms. Common Indian mushrooms. Based on occurrence - Epigenous and Hypogenous with examples, Natural Habitats - Humicolous, Lignicolous and Coprophilous. Structure and development of fruit bodies - gilled fungal and pore fungal and spores.

Unit - II **(12 Hours)**

Fundamentals of cultivation system- small village unit and larger commercial unit. Principles of mushroom farm layout - location of building plot, design of farm, bulk chamber, composting platform, equipments and facilities, sterilization room and growing rooms. Methods of Composting – Long Term and Short Term method.

Unit - III **(12 Hours)**

Media preparation – PDA medium. Facilities required for spawn preparation, preparation of spawn substrate, preparation of pure culture, media used in raising pure culture, culture maintenance and storage of spawn. Importance of casing mixture, quality parameters of casing soil, different types of casing mixtures, commonly used materials.

Unit - IV **(12 Hours)**

Cultivation of button, oyster and straw mushroom - collection of raw materials, compost and composting, spawn and spawning, casing and case run, cropping and crop management, picking and packing. Production technology and post-harvest handling of fresh and processed products and their marketing. Nutrient profile and health benefits of mushroom.

Unit - V **(12 Hours)**

Research Centres – National level and Regional level Cost benefit ratio – Marketing in India and abroad, Export Value. Applications of Mushroom: food, fodder, soil conditioner and fertilizer, nutriceuticals, pharmaceuticals and medicinal properties.

Text Book:

1. Pandey, R. K. and S. K. Ghosh. 2012. A Hand book of Mushroom cultivation. Emkay Publications, New Delhi.

Reference Books:

1. Pathak Yadav Gour. 2010. Mushroom Production and Processing Technology. Agrobios (India).
2. Kannaiyan, S. and K. Ramasamy. 1980. A hand book of edible mushroom, Today and Tomorrows Printers and Publishers, New Delhi
3. Nita Bahl. 2002. Handbook on Mushrooms, Oxford and IBH Publishing Company, New Delhi.
4. Tripathi, D. P. 2005 Mushroom Cultivation, Oxford and IBH Publishing Company Private Limited, New Delhi.
5. Verma, R.N. and B. Vijay. 2006. Recent advances in the cultivation technology of edible mushrooms.

Web References:

1. https://krishijagran.com/agripedia/a-complete-guide-to-profitable-mushroom-farming-in-india-read-composting-harvesting-techniques
2. https://www.sceltamushrooms.com/en/themes/cultivation-harvesting-mushrooms
3. https://extension.psu.edu/six-steps-to-mushroom-farming

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Core Practical

For Students Admitted from the academic year 2020 – 2021

Mushroom Cultivation Technology Practical (20U3BOCP03)

1. Microscopic observations of mushrooms.
2. Pure culture of mushroom-preparation and maintenance.
3. Spawn- media preparation, inoculation, and incubation.
4. Substrate formulations, composting, and pasteurization.
5. Spawning, casing and maintenance of optimum.
6. Cultural conditions, hygiene, and management of pest and diseases.
7. Harvesting, processing and value addition.
8. Qualitative determination of nutritional values.
9. Field visit to mushroom cultivation farm.

Core Practical

For Students Admitted from the academic year 2020 – 2021

Core Major Practical III (For Core Course V)

(Mushroom Cultivation Technology - 20U3BOCP03)

Time: 3 Hours **Max. Marks: 60**

Practical: 50

Record: 10

1. Perform the micropreparations for the given specimen **A.** **(12×1=12)**

(Identification – 3, Slide – 3, Reasons – 3and Diagram – 3)

2. Make suitable mushroom bed preparation of **B**. Leave the bed for valuation. **(20×1=20)**

(Aim – 2, Materials required - 2, Procedure – 6 and preparation mushroom of bed – 10)

3. Name the genus and morphology of given part of **C** and **D.** **(4×2=8)**

(Genus – 2 and Morphology – 2)

4. Identify the **E**. **(5×1=5)**

(Identification – 2 and Reasons – 3)

5. Identify the habitat of given specimen **F**. **(5×1=5)**

Key:

1. Sectioning:

A- Reproductive part

2. Mushroom bed preparation:

B - Mushroom Cultivation

3. Spotters:

C and D – Types of mushrooms

-

4. Spotters:

E – Poisonous mushroom and edible mushroom

5. Spotters:

F – Habitat of the mushroom

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U3BOS01A	Title	Batch	2020 -2023
Hours/Week	02	Horticulture and Nursery Management	Semester	III
			Credits	02

Course Objective

- To study the horticulture, gardening, vegetative propagation of horticultural crops, production technology and nursery management.

Course Outcomes (CO)

K1	CO1	To remember the definition, principles, scope and importance of horticulture.
K2	CO2	To understand the types of gardens, garden adornments, garden designing and garden components.
K3	CO3	Applying of the vegetative propagation of horticultural crops.
K4	CO4	To analyze the nursery types and management strategies.
K5	CO5	Evaluation of cultivation of vegetables, fruits and flowers.

Unit - I **(7 hours)**

Horticulture – Definition, Disciplines, Principles, Scope and Importance. Classification of horticultural crops – Fruits and Vegetables. Growth regulators in horticulture. Preservation of fruits and vegetables. Storage of fruits and vegetables.

Unit - II **(7 hours)**

Gardening - Garden tools and implements, types of garden - ornamental gardens, indoor gardens, kitchen gardens, terrestrial and aquatic gardens. Garden adornments, garden designing, garden components- lawns, shrubs and trees, borders, hedges, edges, drives, walks, topiary, trophy, rockery. Famous gardens of India.

Unit – III **(7 hours)**

Vegetative propagation methods of horticultural crops- cutting, layering, budding and grafting. Advantages and disadvantages of vegetative propagation; micropropagation. Stock scion relationship in horticultural crops. Bonsai, Cut flowers. Flower arrangements - basic styles- upright and slanting. Japanese – ikebana and dry flower arrangement.

Unit – IV **(8 hours)**

Production technology – Olericulture - Cultivation of Brinjal and Cauliflower. Pomology - Cultivation of Apple and Pineapple. Commercial floriculture – Cultivation of jasmine and rose. Commercial horticulture - Extraction of Jasmine concrete and Papain.

Unit – V **(7 hours)**

Nursery - definition, types; management strategies- planning, layout, budgeting- production unit, sales unit. Types of soils and preparation of fields – Manures - organic and inorganic. Pots and containers – tools and implements – watering – types. Plant protection measures for horticulture.

Text Book:

1. Adams, C.R. and Early, M.P. (2004). Principles of Horticulture. Elsevier, New Delhi.

Reference Books:

1. Barton West, R. (1999). Practical Gardening in India. Discovery Publishing House, New Delhi.
2. Chadha, K.L. (2001). Hand Book of Horticulture, ICAR Publications, New Delhi.
3. George Acquaah. (2009). Horticulture Principles and Practices. PHI Learning Private Limited, New Delhi.
4. Kumar, N. (2014). Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.
5. Mazundar, B.C. and Mukhopadhyay, P.M. (2006). Principles & Practices of Herbal Garden. Daya Publishing House, New Delhi.

Web References:

1. https://www.biotecharticles.com/Agriculture-Article/Horticultural-Crops-Nursery-Establishemnt-and-Management-3882.html
2. https://www.toppr.com/content/concept/man-made-vegetative-propagation-20152
3. https://www.topperlearning.com/answer/explain-the-following-1-cutting-2-layering-3-grafting/2cz3dq66

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U3BOS01B	Title	Batch	2020 -2023
Hours/Week	02	Environmental Microbiology	Semester	III
			Credits	02

Course Objective

- To impart knowledge on microbial interactions in plants and animals, microbiology of air and water and microbiology of sewage and sewage treatment methods.

Course Outcomes (CO)

K1	CO1	Able to understand soil microbiota.
K2	CO2	Concepts of metabolic pathways by soil microbes and their role.
K3	CO3	Symbiotic relationship between microbes and plants.
K4	CO4	Water quality parameters -Physico chemo parameters.
K5	CO5	They could able to perform experiments to test the quality of samples.

Unit - I **7 Hours**

Soil microbiology an introduction. Types and significance of soil microbes – Bacteria, Fungi, Actinomycetes, Protozoa, Nematodes and Viruses. Factors affecting soil microbial population.

Unit - II **7 Hours**

Carbon, nitrogen, phosphorous and sulphur - Mechanism of nitrogen fixation - Biofertilizer – Rhizobium, Azotobacter and Cyanobacteria – Mass cultivation, field study and its applications. Quality guidelines for biofertilizers.

Unit - III **7 Hours**

Interaction of microbes with plants – Rhizosphere, Phyllosphere and Mycorrhizae. Microbe-animal interaction - Microbes in ruminants. Plant Pathology – symptoms, disease cycle and its control measures - Bacterial - Citrus canker, Fungal - Wilt of Cotton and Tikka leaf spot of groundnut, Viral – TMV.

Unit - IV **7 Hours**

Enumeration of bacteria from air – Air sampling devices (Settling under Gravity, Centrifugal action, Impingement and Electrostatic precipitation) – Air sanitation. Assessment of drinking water quality (Total count, Membrane filter and MPN) – water standards - indicator organisms – water purification – Waterborne diseases and their control measures.

Unit - V **8 Hours**

Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill). Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment. Biodegradation, Bioremediation, Biodeterioration of wood, paints, leather and textile. Xenobiotics.

Text Books:

1. Joseph C Daniel (1999). Environmental aspects of Microbiology. 2nd edition. Bright Sun Publications, Chennai.

Reference Books:

1. Ralph Mitchell and Ji Dong Gu (2010). Environmental Microbiology. 2nd edition, Wiley-Blackwell, New Jersey.
2. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
3. Mishra R.R (2004). Soil Microbiology. CBS Publishers & Distributers, New Delhi.
4. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
5. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.

Web References:

1. https://www.holganix.com/blog/5-types-of-soil-microbes-and-what-they-do-for-plants
2. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/rhizosphere
3. https://courses.lumenlearning.com/boundless-microbiology/chapter/nitrogen-fixation

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science	
Course Code	20U3BON01	Title	Batch	2020 -2023
Hours/Week	02	Mushroom Cultivation	Semester	III
			Credits	02

Course Objective

- To study the cultivation technology of edible mushroom, types of nutrient content in edible mushrooms, mushroom food preparation and research centres of mushroom.

Course Outcomes (CO)

K1	CO1	To remember the technical aspects of mushroom cultivation.
K2	CO2	To understand the pure culture of mushroom cultivation.
K3	CO3	To apply the marketing of mushroom products.
K4	CO4	To analyze the edible mushroom cultivation, types and nutrient content of edible mushrooms.
K5	CO5	Evaluation of types of foods prepared from mushrooms.

Unit - I **(7 Hours)**

Introduction – history – scope of edible mushroom cultivation – types and nutrient content of edible mushrooms available in India – *Volvariella volvacea, Pleurotus citrinopileatus* and *Agaricus bisporus*. Principles of mushroom cultivation. Poisonous mushrooms.

Unit - II **(7 Hours)**

Pure culture – preparation of medium (PDA and Oatmeal agar medium), sterilization – preparation of test tube slants to store mother culture – culturing of *Pleurotus* mycelium on petri plates, preparation of mother spawn in saline bottle and polypropylene bag and their multiplication.

Unit - III **(7 hours)**

Cultivation Technology : Tools and requirements: substrates (locally available), polythene bag, vessels, inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Mushroom bed preparation – paddy straw, maize straw, sugarcane trash, and banana leaves. Factors affecting the mushroom bed preparation – Low cost technology, composting in mushroom production. Methods of mushroom production. Harvesting of mushrooms. Diseases – Common pest, diseases prevention and control measures.

Unit - IV **(7 Hours)**

Storage and nutrition: Short term storage (Refrigeration – up to 24 hours), Long term Storage (Canning, pickles, papads), drying, storage in salt solution. Nutrition – proteins – amino acids, mineral elements nutrition – carbohydrates, crude fiber content – vitamins.

Unit - V **(8 Hours)**

Food preparation: Types of foods prepared from mushroom – soup, cutlet, omelette, samosa, pickles and curry. Research centers – National level and Regional level. Cost benefit ratio – marketing in India and abroad and export value and Job opportunities.

Text Book:

1. Pathak Yadav Gour. 2010. Mushroom Production and Processing Technology. Agrobios (India).

Text Books:

1. Kannaiyan, S. and K. Ramasamy. 1980. A hand book of edible mushroom, Today and Tomorrows Printers and Publishers, New Delhi
2. Nita Bahl. 2002. Handbook on Mushrooms, Oxford and IBH Publishing Company, New Delhi.
3. Tripathi, D. P. 2005 Mushroom Cultivation, Oxford and IBH Publishing Company Private Limited, New Delhi.
4. Verma, R.N. and B. Vijay. 2006. Recent advances in the cultivation technology of edible mushrooms.
5. Pandey, R. K. and S. K. Ghosh. 2012. A Hand book of Mushroom cultivation. Emkay Publications, New Delhi.

Web References:

1. https://krishijagran.com/agripedia/a-complete-guide-to-profitable-mushroom-farming-in-india-read-composting-harvesting-techniques
2. https://www.sceltamushrooms.com/en/themes/cultivation-harvesting-mushrooms
3. https://extension.psu.edu/six-steps-to-mushroom-farming

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U4BOC04	Title	Batch	2020 -2023
Hours/Week	05	Anatomy, Embryology and Seed Science	Semester	IV
			Credits	05

Course Objective

- Acquiring knowledge on simple and permanent tissues, primary structure of dicot and monocot stem and root, isobilateral and dorsiventral leaf and secondary growth.

Course Outcomes (CO)

K1	CO1	To remember the simple and complex permanent tissues.
K2	CO2	To understand the primary and secondary growth of monocot and dicot stem and root.
K3	CO3	To apply the general principles of seed production.
K4	CO4	To analyze the reproductive structures of an angiospermic plant.
K5	CO5	Evaluation of pollination, fertilization, double fertilization and triple fusion.

Unit - I **(12 Hours)**

Anatomy - Introduction. Shoot apex theory. Meristems, definition, differentiation, redifferentiation and dedifferentiation, totipotency. Ergastic substances (Cystolith, Raphides, Sphaeroraphides and Tannins). Classification of meristems – apical meristems, lateral meristems and intercalary meristems and various concepts of apical meristems. Epidermal tissue system – trichomes and stomata. Laticifers.

Unit - II **(12 Hours)**

Plant tissues - Classification – simple tissues and permanent tissues - Parenchyma, Collenchyma, Sclerenchyma. Complex tissues - Xylem and Phloem. Annual rings – heart wood, sap wood. Primary structure of root and stem in dicots and monocots. Isobilateral and dorsiventral leaf.

Unit - III **(12 Hours)**

Secondary growth - Anomalous secondary growth in dicot stems –*Bignonia*, *Nyctanthus* and *Boerhaavia* and monocot stem -*Dracaena.* Nodal anatomy – uni, tri and multilacunar node. Root stem transition.

Unit - IV **(12 Hours)**

Embryology - Structure and development of anther. Development of male gametophyte. Ultra structure of pollen grains. Types of ovules. Development of female gametophyte: Monosporic (Polygonum), Pollination, fertilization, double fertilization and triple fusion. Endosperm: Nuclear,

Cellular, Helobial and Ruminate. Development of Embryo in Dicot (*Capsella – bursa pastoris*). Polyembryony.

Unit - V **(12 Hours)**

Introduction – role and goal of seed technology. General principle of seed production – seed quality – purity of seed production, seed viability – seed germination test, Tetrazolium test. Types of seed germination – hypogeal and epigeal. Field and seed inspection - seed certification- seed legislation.

Text Book:

1. Vashishta, P. C. 2000. A Text Book of Plant Anatomy. S. Chand and Company, New Delhi.

Reference Books:

1. Bhojwani, S. S. and Bhatnagar, S. P. 2009. The Embryology of Angiosperms, Vikas Publishing House Private Limited, New Delhi.
2. Rattan Lal Agarwal. 2004. Seed Technology. Oxford and IBH Publishing Company Private Limited, New Delhi.
3. Fahn, A. 1982. Plant Anatomy (3rd Edition). Pergoman Press, Oxford.
4. Esau, K. 1960. Plant Anatomy, Wiley Eastern Private Limited, New Delhi.
5. Maheswari, P. 1971. An Introduction to the Embryology of Angiosperms. Tata McGraw Hill Publishing Company Limited, New Delhi.

Web References:

1. https://www.annualreviews.org/doi/abs/10.1146/annurev.genet.36.040102.131941
2. https://agriinfo.in/role-and-goal-of-seed-technology-in-crop-production-78
3. https://www.askiitians.com/biology/anatomy-of-flowering-plants/internal-structure-of-stems-roots-and-leaves.htmlomy/304

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Core Practical

For Students Admitted from the academic year 2020 – 2021

Anatomy, Embryology and Seed Science-20U4BOCP04

1. Study of Ergastic substances (Cystolith, Raphides, Sphaeroraphides and Tannins)
2. Study of simple and complex tissues by using permanent slides.
3. Study of dorsiventral and isobilateral leaf.
4. Study of primary structure of dicot root, stem.
5. Study of primary structure of monocot root and stem.
6. Normal secondary structure in dicot stem and root.
7. Anomalous secondary structure in dicot plants – *Aristolochia, Bignonia, Nycthanthus* and *Boerhaavia.*
8. Anomalous secondary growth in monocot plant - *Dracaena* (Permanent slide).
9. Study the anatomical structure of types of node
10. T.S. of anther (Permanent slide).
11. Types of ovules (Permanent slides).
12. Types of embryo mounting.
13. Types of seed germination – hypogeal and epigeal.

Core Practical

For Students Admitted from the academic year 2020 – 2021

Core Major Practical IV (For Core Course VII)

Anatomy, Embryology and Seed Science

20U4BOCP04

Time: 3 Hours **Max. Marks: 60**

Practical: 50

Record: 10

1. Perform the micropreparations for the given specimen **A, B** and **C**. **(8×3=24)**

(Identification – 1, Slide – 2, Reasons – 3 and Diagram – 2)

2. Dissect and mount any one of the stages of the given material **D.** (Diagrams and notes not necessary).(Slide – 6) **(6×1=6)**

3. Write critical notes on **E, F, G** and **H.** **(4×4=16)**

(Identification – 2, Diagram -1 and Notes -1)

4. Comment on **I.** **(4×1=4)**

(Identification – 2, Diagram -1 and Notes -1)

Key:

1. Sectioning - Anatomy:

A and B - Primary structure

C - Secondary anamolous structure

2. Mounting - Embryology:

D - Dicot embryo - *Tridax*

3. Spotters – Permanent slides – Anatomy and Embryology:

E - Ergastic substances and simple and complex permanent tissues

F - Primary and secondary structure

G - Anamolous secondary growth

H - T. S. of anther and types of ovules

4. Spotters – Seed science:

I – Types of seed germination

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U4BOS02A	Title	Batch	2020 -2023
Hours/Week	02	Fundamentals of Microbiology and Plant Pathology	Semester	IV
			Credits	02

Course Objectives

- Acquiring knowledge on classification and nomenclature of microbes and culture media.
- Acquiring knowledge on symptoms, etiology and control measures of some important plant diseases.

Course Outcomes (CO)

K1	CO1	To remember the classification and nomenclature of microbes.
K2	CO2	Understanding the sterilization techniques.
K3	CO3	Application of industrial uses of microbes.
K4	CO4	To analyze the plant diseases caused by microbes.
K5	CO5	To evaluate the causal agents, transmission and control measures of plant diseases.

Unit - I **(7 Hours)**

Definition, scope, history and recent developments of microbiology. Classification of microbial kingdom- Whitakers system of classification. Binomial nomenclature of microbes. Types of microbes.

Unit - II **(7 Hours)**

Sterilization- Principles - dry and moist heat - Tyndallisation, Pasteurization and Autoclaving, Radiation and Filtration - Disinfection and Disinfective agents – Sterility control for dry heat, moist heat and radiation.

Unit - III **(7 Hours)**

Bergey's classification of bacteria, viral classification, virions and viroids, culture media – culture and its types - Batch, Fed-batch, Continuous, Industrial use of Microbes – substrates, growth parameters and recovery of products (organic acids – Citric acid, antibiotics –Penicillin and enzymes - Amylase).

Unit - IV **(8 Hours)**

A general account of plant diseases, causal agents and symptoms - bacteria, fungi, and viruses. Insect transmission of bacteria and viruses. Disease control - physical, chemical and biological methods.

Unit - V **(7 Hours)**

Study of symptoms, etiology and control measures of the following diseases – Fungal disease - Red rot of sugarcane, Bacterial disease - Bacterial blight of rice and Citrus canker and viral disease - Tobacco mosaic disease.

Text Books:

1. Dubey, R. C. and Maheshwari, D. K. 2005. A Text Book of Microbiology S. Chand and Company Limited, New Delhi.

Reference Books:

1. Pelzer, T. R., Chan, M. J., and Kreig, N. R. 1993. Microbiology. Mc Graw –Hill Inc, New York.
2. Prescott, L. M.., Harley, J. P. and Klein, D. A. 1993. Microbiology, 2nd Edition, WM. C. Brown Publishers, United States of America.
3. Sundara Rajan, S. 2003. College Microbiology. Volume I and II Revised Edition, Vardhana Publication, Bangalore.
4. Robert, I. Tate. 1995. Soil Microbiology, First Edition, John Wiley and Sons Inc., New York.
5. Sharma, P. D. 2006. Plant Pathology, Narosa Publishing House, New Delhi.

Web References:

1. https://courses.lumenlearning.com/boundless-microbiology/chapter/classification-of-microorganisms
2. https://www.cib.csic.es/facilities/internal-services/sterilization-culture-media-preparation-and-labware-washing
3. https://erec.ifas.ufl.edu/plant_pathology_guidelines/module_07.shtml

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U4BOS02B	Title	Batch	2020 -2023
Hours/Week	02	Industrial Botany	Semester	IV
			Credits	02

Course Objectives

- To understand the basic details about industrial techniques related to plantsciences.
- To familiarize with the techniques providing employment opportunities to undergraduate botany students.

Course Outcomes (CO)

K1	CO1	To remember the applications of Single Cell Protein.
K2	CO2	Understanding the production technology of biofuels.
K3	CO3	Application of various cultivation methods of edible mushrooms.
K4	CO4	To analyze the fermentation techniques.
K5	CO5	To evaluate the preparation and cosmaceutical agents.

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Unit - I **(7 Hours)**

Single Cell Protein – Algal single cell protein – *Spirulina* mass cultivation and its applications. *Chlorella* mass cultivation and its applications. Bacterial single cell protein mass cultivation. Fungal single cell protein – mass cultivation of Yeast.

Unit – II **(7 Hours)**

Introduction to biofuels- Industrial production of bioethanol and uses. Biodiesel- manufacture of biodiesel, uses and advantages of biodiesel. Biogas production and uses of biogas. Biohydrogen production and its uses.

Unit – III **(7 Hours)**

Nutritive value of edible mushrooms. Medicinal values of mushrooms. Poisonous mushrooms. Morphology of common edible mushrooms - Cultivation of paddy straw mushroom, cultivation of oyster mushroom and cultivation of white button mushroom.

Unit – IV **(7 Hours)**

Introduction to fermentation technology - Stages of fermentation, designing of bioreactors, formulation and sterilization of medium. Isolation and selection of microorganism, production of stock culture and inoculum development Culture of microorganism in bioreactor. Important fermentation products.

Unit – V **(7 Hours)**

Preparation and processing of cosmaceutical agents (peppermint oil, lavender oil, Lemon grass oil) and natural pesticides (neem and pyrethrum). Cultivation and post-harvest technology of *Vinca rosea* and *Gloriosa superba.*

Text Book:

1. Pandey, R. K. and S. K. Ghosh. 2012. A Hand book of Mushroom cultivation. Emkay Publications, New Delhi.

Reference Books:

1. Kumaresan V. 2013. Biotechnology. Saras Publication, Nagercoil.
2. Annie Ragland and Kumaresan. 2013. Angiosperms. Saras Publication, Nagercoil.
3. Kokate, CK Purohit AP and Gokahale. 2002. Pharmacognosy, NiraliPrakasan.
4. Hema Sane *et al*. 2013. Text book of industrial botany. Vision Publication, India.
5. Dubey R C. 2006. A Text book of Biotechnology, Chand Publication, New Delhi.

Web References:

1. https://krishijagran.com/agripedia/a-complete-guide-to-profitable-mushroom-farming-in-india-read-composting-harvesting-techniques
2. https://www.sceltamushrooms.com/en/themes/cultivation-harvesting-mushrooms
3. https://extension.psu.edu/six-steps-to-mushroom-farming
4. Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science	
Course Code	20U4BON02	Title	Batch	2020 -2023
Hours/Week	02	Herbal Botany	Semester	IV
			Credits	02

Course Objective

- To study the various Indian systems of medicines, cultivation, macro and microscopic characters, chemical constituents and therapeutic uses of selected medicinal plants and drugs acting on the central nervous system, gastrointestinal tract and cardio vascular system.

Course Outcomes (CO)

K1	CO1	To remember the various Indian systems of medicines.
K2	CO2	To understand the tribes and native medicines.
K3	CO3	To apply the technical aspects of cultivation and medicinal uses of selected medicinal plants.
K4	CO4	To analyze the various drugs acting on different organ systems of human.
K5	CO5	Evaluation of chemical constituents and therapeutic uses of drugs from root, bark, stem and underground stem.

Unit - I **(7 Hours)**

Brief history of medicinal plants. Indian systems of Medicine: Siddha. Ayurvedha and Unani. Classification of crude drugs. Chemistry of drugs (Alkaloids, Flavanoids, Glycosides and Tannins).

Unit - II **(7 Hours)**

Ethnobotany – its scope and interdisciplinary approaches. Tribal distribution and life style in Tamilnadu. Native medicine – Malayalis, Irulas and Thodas. Common practice – rituals, mode of preparation and administration of crude drugs.

Unit - III **(7 Hours)**

Cultivation, macro and microscopic characters, chemical constituents and therapeutic uses of drugs from root (*Vinca rosea*), drugs from bark (*Cinchona officinalis*), drugs from stem of wood (*Ephedra sp.*) and drugs from underground stem (*Zingiber officinale*).

Unit - IV **(7 Hours)** Cultivation, micro and macroscopic characters, chemical constituents and therapeutic uses of drugs from leaves (*Aloe vera*), flower (*Eugenia jambolana)*, fruits (*Feronia elephantum*) and seeds (*Coriandrum sativum*).

Unit - V **(8 Hours)**

A brief account on drugs acting on central nervous system (CNS stimulants and CNS depressants). Drugs used in disorders of gastrointestinal tract (Carminatives, Bulk laxatives and Purgatives) and cardio vascular drugs (Cardiotonics and Cardiac depressants).

Text Book:

1. Jain, S. K. 1987. A Manual of Ethnobotany. Scientific Publishers, Jodhpur.

Reference Books:

1. Gokhale, S. B., Kokate, C. K. and Purohit, A. P. 2010. Pharmacognosy. Nirali Prakashan, Pune.
2. Jain, 2001. Medicinal Plants. National Book Trust, New Delhi.
3. Handa, S. S. and Kapoor, V. K. 1993. Pharmacognosy. Vallabh Prakshan, New Delhi.
4. Wallis, T. E., 1997. Text Book of Pharmacognosy. C.B.S Publishers, Bangalore.
5. Purohit and Vyas, 2004. Medicinal Plants Cultivation, Agrobios Publication, Jodhpur.

Web References:

1. http://www.gputtawar.edu.in/downloads/classificationofcrudedrugs.pdf
2. http://botanicaldimensions.org/what-is-ethnobotany
3. https://www.slideshare.net/AumnmumuAlshaty/drugs-acting-on-the-central-nervous-system

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science	
Course Code	20U5BOC05	Title	Batch	2020 -2023
Hours/Week	06	Morphology and Taxonomy of Angiosperms	Semester	V
			Credits	05

Course Objective

- To study the morphological features and classification of angiospermic plants and vegetative and reproductive characters and economic importance of selected angiospermic families.

Course Outcomes (CO)

K1	CO1	To remember the morphology of angiosperms.
K2	CO2	To understand the different types of angiosperms classification.
K3	CO3	To apply the economic importance of selected families.
K4	CO4	To analyze the vegetative and reproductive characters of selected families of angiosperms.
K5	CO5	Evaluation of functions of Botanical Survey of India.

Unit - I **(12 Hours)**

The parts of Plant, Root- Types and Modifications, Stem- Types, Aerial and Underground Stem Modifications, Leaf- Phyllotaxy, Simple and Compound leaves, Leaf parts - Leaf base, Stipule, Petiole, Lamina- shape, apex, margin, surface, texture, Venation and Modifications of leaf.

Unit - II **(12 Hours)**

Inflorescence Types – Racemose, Cymose and special types (Cyathium, Hypanthodium). Flower- essential and non-essential parts and its arrangements (Bract, Bracteoles, calyx and corolla shapes, androecium, gynoecium- placentation, floral diagram and floral formula). Fruit - classification of fruits (Outline only). Seed dispersion and types of germination of seed.

Unit - III **(12 Hours)**

History of Taxonomy - Systems of classification - Artificial system (Linnaeus) - Natural system (Bentham & Hooker), Phylogenetic system (Engler & Prantl), Merits and Demerits of their systems. Binomial nomenclature, Author citation. Herbarium Techniques and BSI.

Unit - IV **(12 Hours)**

Terminology used in Taxonomy. A detailed study of the following families and their economic importance: Annonaceae, Nympheaceae, Capparidaceae, Rutaceae, Anacardiaceae, Fabaceae, Caesalpiniaceae, Mimosaceae, Cucurbitaceae, Apiaceae.

Unit – V **(12 Hours)**

A detailed study of the following families and their economic importance: Rubiaceae, Asteraceae, Asclepiadaceae, Apocynaceae, Acanthaceae, Lamiaceae, Sapotaceae, Verbenaceae, Amaranthaceae and Poaceae.

Text Book:

1. Pandey, S. N. and Misra, S. P. 2008. Taxonomy of Angiosperms. Ane Books Private Limited, New Delhi.

Reference Books:

1. Lawrence, G. H. M. 1953. Taxonomy of Vascular Plants, Oxford and IBH Publishes, New Delhi.
2. Pandey, P. B. 1989. Taxonomy of Angiosperms (Systematic Botany), S. Chand and Co. Limited, New Delhi.
3. Singh. V. and Jain, D. K. 2004. Taxonomy of Angiosperms. Rastogi Publications, Meerut.
4. Sambamurty, A.V.S.S. 2005. Taxonomy of Angiosperms. I.K. International Private Limited, New Delhi
5. Vashista, P. C. 1997. Taxonomy of Angiosperms. S. Chand and Co., New Delhi.

Web References:

1. https://www.biologydiscussion.com/plant-taxonomy/morphology-and-plant-taxonomy/30414
2. http://aptitude.brainkart.com/aptitude/upsc-civil-services-entrance-exams
3. https://www.wileyindia.com/taxonomy-of-angiosperms.html

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science	
Course Code	20U5BOC06	Title	Batch	2020 -2023
Hours/Week	06	Cell Biology and Genetics	Semester	V
			Credits	05

Course Objective

- To study the structure and functions of cell organelles, DNA structure, types of cell division and Mendel Laws of inheritance.

Course Outcomes (CO)

K1	CO1	To remember structure and functions of cell.
K2	CO2	To understand the structure and types DNA.
K3	CO3	To apply the Mendel laws of inheritance.
K4	CO4	To analyze the linkage and crossing over.
K5	CO5	Evaluation the types of mutation.

Unit – I **(12 Hours)**

Ultra structure of plant cell and cell theory. Cell wall, Plasma membrane: Chemical composition, Models for structure of membrane, Cell organelles: Structure and functions of Endoplasmic reticulum, Golgi complex, Lysosome, Peroxisome, Glyoxysome, Mitochondria, Chloroplast, Ribosomes and Nucleus.

Unit – II **(12 Hours)**

Nucleic acids: DNA structure, types, replication. RNA structure, types. Chromosome - Molecular structure of gene and chromosome. Types of chromosomes- based on the position of centromere, Polytene chromosome and lamp brush chromosomes. Cell cycle, Amitosis, Mitosis and Meiosis.

Unit – III **(12 Hours)**

Definition of Genetics, Scope and applications of Genetics. Theories on inheritance : Vapor and fluid theories. Magnetic power theory, Preformation theories, Epigenetic theory, Particulate theories. Chromosome theory of heredity (Sutton - Boveri). Johann Gregor Mendel's experiments and laws of inheritance. Modifications of Mendelian ratios. Atavism, Penetrance, Expressivity, Pleiotropism. Incomplete dominance (in *Mirabilis jalapa*),

Dominant Lethal factors (in Mice), Recessive lethal factors (in *Snapdragon*), Complementary factors (flower colour in *Lathyrus odoratus*), Dominant Epistasis (Fruit colour in *Cucurbita*), Recessive Epistasis (Petiole length in Tobacco).

Unit – IV **(12 Hours)**

Linkage: Types- complete linkage and incomplete linkage. Linked groups, Factors affecting linkage. Crossing over: Types, Mechanism of crossing over and theories on crossing over. Cytological evidence for crossing over. Factors affecting crossing over. mapping of genes on chromosomes, sex linkage-Drosophila (eye colour) and humans (Haemophilia), cytoplasmic inheritance (plastid inheritance, male sterility in corn)

Unit - V **(12 Hours)**

Sex determination in *Melandrium*. Mutation: Types. Chromosome variation in number and structure, Syndromes in man (Klinefelter's syndrome, Turner's syndrome, Down's syndrome, Mongolism). Detection in *Neurospora*, CLB technique to detect mutation. Population genetics: Definition, Hardy - Weinberg principle, significance and its application. Factors affecting gene frequencies, Gene pool, Genetic drift and frequency.

Text Book:

1. Verma, P. S. and Agarwal, V. K. 2009. Genetics. S. Chand and Company Limited, New Delhi.

Reference Books:

1. Robert H. Tamarin. 2002. Principles of Genetics. Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. Sundararajan, S. 2000. Cytogenetics. Anmol Publications Private Limited, New Delhi.
3. Verma, P. S. and Agarwal, V. K. 2008. Cytology. Chand and Company Limited, New Delhi.
4. David Freifelder. 1987. Molecular Biology. N. K. Narosa Publishing House, New Delhi.
5. Sambamurty, A. V. S. S. 2008. Molecular Biology. Narosa Publishing House Private Limited, Chennai.

Web References:

1. https://microbenotes.com/cell-organelles
2. https://www.sciencelearn.org.nz/resources/1999-mendel-s-experiments
3. https://www.slideshare.net/krishnabajal/linkage-and-crossing-over-dr-krishna

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science	
Course Code	20U5BOC07	Title	Batch	2020 -2023
Hours/Week	06	Plant Biotechnology, Microscopy and Microtechnique	Semester	V
			Credits	05

Course Objective

- To study the culture techniques, genetic engineering, different types of microscope and permanent slide preparation.

Course Outcomes (CO)

K1	CO1	To remember the culture techniques and media preparation.
K2	CO2	To understand the principles and techniques of genetic engineering.
K3	CO3	To apply plant tissue culture in agriculture and forestry.
K4	CO4	To analyze the principle and components of different types of microscopes.
K5	CO5	Evaluation the permanent slide preparation.

UNIT – I **(12 Hours)**

Biotechnology – definition, history demand for biological resources, achievements. Plant tissue culture – History and principle – totipotency – Culture techniques – tissue culture media – MS media preparation – sterilization techniques.

UNIT – II **(12 Hours)**

Explant preparation and callus induction, Direct and indirect organogenesis. Micro propagation. Protoplast fusion – somatic embryogenesis. Application of Plant Tissue Culture in agriculture and forestry. Improvement of hybrid varieties – Transgenic plants, production of disease resistant crops, Production of stress resistant crops.

UNIT – III **(12 Hours)**

Genetic engineering – Scope and aims of genetic engineering, Principle and techniques – Gene isolation, Gene transfer system – Direct and indirect gene transfer – Use of Microbes as gene transfer Vehicles – *Agrobacterium tumifaciens*, Plasmid, Cosmid and Phages. Basic concept of recombinant DNA technology.

Unit – IV **(12 Hours)**

Light Microscopy- principles, Lens-Refraction, Dispersion of light. Aberration of lenses-Spherical, Chromatic. Image formation, Image quality, Magnification-Resolution & Resolving power. Types of microscopes – Students compound microscope, Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM)

Unit – V **(12 Hours)**

Permanent slide preparation – Fixation and fixatives, Clearing, Wax impregnation, Block making, Microtomes-Rotary Microtome and staining - Principles, Types (Natural and Chemical), Mordants. Types of staining – Single staining and Double staining, Mounting.

Text Book:

1. Dubey, R. C. 2001. A Text Book of Biotechnology. S. Chand and Company Limited, New Delhi.

Reference Books:

1. Trivedi, P.C. 2000. Plant Biotechnology, Panima Publishing Corporation, New Delhi.
2. Lewin, B. 2003. Genes VI, Allied Publishers, Chennai.
3. Kalyan Kumar, D. 1999. An Introduction to Plant Tissue Culture, New Central Book Agency, Calcutta.
4. Ashok Kumar. 2006. Plant Biotechnology. Discovery Publishing House, New Delhi.
5. Marimuthu, R. 2008. Microscopy and Microtechnique. MJP Publishers, Chennai.

Web References

1. https://geneticeducation.co.in/what-is-genetic-engineering-definition-types-process-and-application
2. https://www.microscopemaster.com/different-types-of-microscopes.html
3. https://www.ronaldschulte.nl/en/microtomes-general.html

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Core Major Practical V (For Core Course IX, X and XI)

(Morphology and Taxonomy of Angiosperms, Cell Biology and Genetics and Plant Biotechnology, Microscopy and Microtechnique)

20U5BOCP05

Morphology and Taxonomy of Angiosperms:

1. Study of the morphology of angiosperms as mentioned in theory part, with the help of suitable examples.
2. Description of plants in technical terms.
3. Dissection of vegetative and floral parts of plants belonging to the above families.
4. Study of the Botany of the economic plants in the theory part.
5. Field trip to hill stations recommended for three to five days under the guidance of teachers.
6. Herbarium (minimum of 20 Herbarium sheets of weeds and common plants of Angiosperms) with the proper field note book shall be submitted at the Practical Examination.

Cell biology:

1. Study and Squash and Smear with suitable materials.

2. Study of induced aberrations in onion root tip using chemicals.
3. Observation of electron micrographs of sub-cellular structures.

Genetics:

1. Simple problems about segregation and independent assortment and gene interaction.

2. Chromosome mapping from three point test cross-data (Linkage and Crossing over percentage).

3. To study the population genetics problems applying Hardy-Weinberg law.

Model practical question paper for B.Sc., Botany Degree Examination

Core Major Practical V (For Core Course IX, X and XI)

(Morphology and Taxonomy of Angiosperms and Cell Biology and Genetics)

20U5BOCP05

Time: 3 Hrs **Maximum: 60 marks**
Practical : 40 marks
Herbarium: 10 marks
Record : 10 marks

1. Refer **A** to their respective families. Point out the characters on which the identification is based at each level. (Diagrams not necessary) **(1×5=5)**
2. Describe **B** in technical terms. Draw diagrams of the floral parts only. Construct the floral diagram. Write down the floral formula. **(1×5=5)**
3. Dissect and mount the given part **C** for valuation**.** (Aestivation/ anther/ placentation) draw diagrams. **(1×4=4)**
4. Make acetocarmine preparations of **D** (squash) (any one stage) draw diagrams. **(1×4=4)**
5. Construct chromosome map with the data provided. **(1×5=5)**
6. Solve the given genetic problems **E** and **F**. **(2×3=6)**
7. Write note on **G**. **(1×3=3)**
8. Write the name of the genus, species, family and morphology of the useful parts of **H** and **I**. **(2×4=8)**

Key:

A, B and **C** - Families under Taxonomy

D - Cell biology

E and **F** - Genetics

G - Cell biology spotters

H and **I** - Morphology

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U5BOE01A	Title	Batch	2020 -2023
Hours/Week	4	Plant Breeding and Evolution	Semester	V
			Credits	03

Course Objective

- To study the selection methods of plant breeding, hybridization, plant production, crop improvement and evolutionary theories.

Course Outcomes (CO)

K1	CO1	To remember the selection methods of plant breeding.
K2	CO2	To understand the hybridization techniques.
K3	CO3	To apply the plant breeding for production of high yield varieties.
K4	CO4	To analyze the breeding methods for crop improvement.
K5	CO5	To evaluate the various theories on evolution.

Unit - I **(12 Hours)**

Introduction and objectives of plant breeding, its relationship with other sciences. Important achievements and undesirable consequences of plant breeding. Procedure and significance of Plant introduction, domestication and acclimatization. Selection and Methods of Plant Breeding- Pure, Clonal and Mass.

Unit - II **(12 Hours)**

Hybridization techniques -types and procedures of hybridization - heterosis. Hybrid vigour and utilization. Mutation in breeding- Spontaneous Mutations, Mutagens and Induced Mutations. Importance of Polyploids in plant breeding. Genetic erosion: reasons, impacts and preventive methods.

Unit - III **(12 Hours)**

Plant production and haploid plants in breeding. Apomixes- importance of male sterility, Plant Breeding for Production of high yield varieties, developing Resistance to Insect Pest, Production of disease resistant and drought varieties.

Unit - IV **(12 Hours)**

Breeding for crop improvement with reference to Paddy, Wheat, Sugarcane and Ground nut. Significance and impacts of transgenic crops in crop improvement.

Unit - V **(12 Hours)**

Paleontology and Evolutionary History. Evolution- theory and its types- Origin of life- theories of organic evolution: Lamarckism, Neo-Lamarckism, Darwinism, Neo-Darwinism,

Mutation theory and synthetic theory- speciation and isolating mechanisms. Modern synthetic theory of Molecular evolution.

Text Book:

1. Allard, R. W. 1960. Principles of Plant Breeding. John Wiley and Sons, New York.

Reference Books:

1. Sundararajan, S. 2000. Cytogenetics. Anmol Publications Private Limited, New Delhi.
2. Chaudhari, H. K. 1984. Elementary Principles of Plant Breeding. Oxford and IBH Publishing Company Private Limited, New Delhi.
3. Sharma, J. R. 1994. Principles and Practice of Plant Breeding, Tata McGraw Hill Publishing Co Ltd., New Delhi.
4. Shukla, R. S. and Chandel, P. S. 1977. Cytogenetics, Evolution and Plant Breeding. S. Chand and Company, New Delhi.
5. Verma, P. S. and Agarwal, V. K. 1998. Concepts of Evolution. S. Chand and Company, New Delhi.

Web References:

1. https://www.britannica.com/science/plant-breeding
2. https://www.ag.ndsu.edu/plantsciences/research/durum/breeding-methods
3. https://byjus.com/biology/modern-synthetic-theory-evolution

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U5BOE01B	Title	Batch	2020 -2023
Hours/Week	04	Forest Botany	Semester	V
			Credits	03

Course Objective

- To study the various types of forest and its beneficiary nature.

Course Outcomes (CO)

K1	CO1	To remember the cultivation methods followed in the development of forest.
K2	CO2	To understand the importance of trees for living beings.
K3	CO3	Familiarizing the causes, effect and control measures of different types of pollution.
K4	CO4	To analyze the objectives, classification and importance of social forestry.
K5	CO5	To evaluate the different types of forest products.

Unit – I **(8 Hours)**

Forest - Natural and Manmade, Types - Tropical, temperate, evergreen, semi evergreen, deciduous; Monoculture and Polyculture, Uses -multipurpose, social and industrial. Forest and gene conservation; Overview of Forest types in South India.

Unit – II **(7 Hours)**

Silviculture: Method and scope of natural and artificial regeneration of forests. Classification of Silviculture system - Clear felling, uniform shelter, wood selection, coppice and conservation system. Silviculture practices in some plant species - *Tectona grandis*, *Eucalyptus*, *Terminalia arjuna, Dalbergia sissoo*, *Santalum album, Acacia nilotica*, *Hevea brasiliensis*.

Unit – III **(7 Hours)**

Social forestry - social attitudes and community participation, Social forestry in India – objectives and mission. Social forestry - Avenue plantation. Agroforestry – objectives, classification and importance. Selection and utilization of trees in various purposes - Food, fodder and energy. Sacred plants and their importance – *Ficus religiosa, Aegle marmelos*, *Azadirachta indica.*

Unit – IV **(7 Hours)**

Trees –types and canopy structure. Seed orchards – types and establishment, seed dormancy - Types of dormancy, Methods of treatment for breaking down dormancy - physical and chemical methods. Forest laws - principles, Indian forest act 1927 and their amendments.

Unit – V **(7 Hours)**

Forest products – timbers and non-timber forest products (Gums, resins, nuts, rubber and medicinal plants). Forest Protection in Indian Forestry – Injuries caused by agency like humans, animals and plants, and their control measures.

Text Book:

1. Chundawat, B.S. and Gautham, S.K. 1996. Text Book of Agroforestry. Oxford and IBH Publisher, New Delhi.

Reference Books:

1. Dhiman, A.K. 2003. Sacred plants and their medicinal uses. Daya publishing house, New Delhi.
2. Kollmann, F.F.P. and Cote, W.A. 1988. Wood Science and Technology. Vol. I & II Springer Verlag, New York.
3. Mehta, T. 1981. A Handbook of Forest Utilization. Periodical Expert Book Agency, New Delhi.
4. Sagreiya, K.P. 1994. Forests and Forestry (Revised by S.S. Negi). National Book Trust, New Delhi.
5. Sharma, P.D. 2004. Ecology and Environment. Rastogi Publications, Meerut.

Web References:

1. http://edugreen.teri.res.in/explore/forestry/social.htm
2. https://www.maineforestry.net/what-is-silviculture
3. https://www.conserve-energy-future.com

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U6BOC08	Title	Batch	2020 -2023
Hours/Week	06	Plant Physiology and Biochemistry	Semester	VI
			Credits	05

Course Objective

- To study the structure and properties of water, photosynthesis, role of plant growth hormones, structure and functions of carbohydrates, amino acids, proteins and lipids and respiration.

Course Outcomes (CO)

K1	CO1	To remember the absorption of water and ascent of sap.
K2	CO2	To understand the photosynthesis in higher plants and significance.
K3	CO3	Familiarizing the physiological effects of plant growth hormones.
K4	CO4	To analyze the structure and functions of carbohydrates, amino acids, proteins and lipids.
K5	CO5	To evaluate the aerobic and anaerobic respiration.

Unit – I **(12 Hours)**

Structure and properties of water- Diffusion, osmosis, osmotic pressure, osmotic potential, turgor pressure, imbibition, matric potential. Absorption of water (active and passive).Ascent of sap; concepts of symplast and apoplast. Guttation and transpiration, Macro and Micro nutrients; Role of essential nutrients in plant metabolism and their deficiency symptoms and control measures.

Unit - II **(12 Hours)**

Photosynthesis in higher plants-Definition and Significance. Electromagnetic radiation. Photosynthetic apparatus -photosynthesis and its evidences. Red drop and Emerson enhancement effect. Absorption spectrum, Action spectrum, Photosystems I & II, Fluorescence and phosphorescence. Photochemical phase- Electron transport chain, Photophosphorylation- (cyclic and non cyclic), Z - Scheme of Photosynthetic Electron Transfer. Biosynthetic phase-Benson and Calvin cycle, Hatch and Slack pathway. Photorespiration.

Unit - III **(12 Hours)**

The hormone concept in plants. Physiological effect of Auxins, gibberellins, cytokinins, abscisic acid and ethylene. Physiology of senescence and abscission. Plant movements-

Phototropism, gravitropism. Nyctinastic and seismonatic movements. Photomorphogenesis: Phytochrome: chemistry and physiological effects. Photoperiodism Vernalization. Seed dormancy and germination.

Unit - IV **(12 Hours)**

Biological nitrogen fixation, symbiotic nitrogen fixation in leguminous plants. Classification, Structure and functions of carbohydrates, Amino acids, Proteins and Lipids.

Unit - V **(12 Hours)**

Respiration: respiratory substrates. Aerobic and anaerobic. Glycolysis. Kreb's Cycle and oxidative phosphorylation, energetics of respiration. Law of limiting factors. Enzymes Classification (IUB), Mechanism of enzyme action, Co-enzymes, inhibition, regulation: allosteric enzymes, Isoenzymes.

Text Book:

1. Verma, V. 2001. A Text Book of Plant Physiology. Emkay Publications, New Delhi.

Reference Books:

1. Frank B. Salisbury and Cleon W. Ross. 2002. Plant Physiology 3rd Edition. CBS Publishers and Distributors, New Delhi.
2. Harborne, J.B. 2000. Plant Biochemistry. Harcourt Asia Private Limited, India and Academic Press, Singapore.
3. Lincoln Taiz and Eduardo Zeiger. 2002. Plant Physiology. 2nd Edition. Sinauer Associates, Inc. Publishers. Sunderland, Massachusetts.
4. Ray Noggle, G. and George J. Fritz. 2004. Introductory Plant Physiology. Prentice Hall of India Pvt. Ltd., New Delhi.
5. Sinha, R. K. 2007. Modern Plant Physiology. 2nd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.

Web References:

1. https://photosynthesiseducation.com/photosynthesis-and-cellular-respiration
2. https://byjus.com/biology/plant-growth-regulators
3. https://byjus.com/biology/photoperiodism-vernalisation

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U6BOC09	Title	Batch	2020 -2023
Hours/Week	06	Plant Ecology, Phytogeography and Conservation Biology	Semester	VI
			Credits	05

Course Objective

- To study the components and types of ecosystem, food chain, food web, ecological pyramid, plant succession, pollution, geographical regions of India and in situ and ex situ conservation.

Course Outcomes (CO)

K1	CO1	To remember the concepts and components of ecosystem.
K2	CO2	To understand the types of ecosystem, food chain, food web, ecological pyramid and biogeochemical cycles.
K3	CO3	Familiarizing the causes, effect and control measures of different types of pollution.
K4	CO4	To analyze the phytogeographical regions and vegetation of India.
K5	CO5	To evaluate the in situ conservation and ex situ conservation.

Unit – I **(12 Hours)**

Importance of study of Ecology, Concept, Components of Ecosystem – Biotic and Abiotic factors (Light, Temperature, Humidity and Wind). Study of plant communities - Autecology (Life forms, Periodicity and floristic composition). Quantitative analysis of plant communities (Quadrat method).

Unit – II **(12 Hours)**

Types of Ecosystem- Natural and artificial ecosystems, study of pond, grassland and forest ecosystem. Energy flow, food chain, food web and ecological pyramids. Biogeochemical cycles – Carbon Cycle, Nitrogen Cycle, Phosphorus cycle and Hydrological Cycle.

Unit – III **(12 Hours)**

Vegetation - Development of vegetation-migration, ecesis, colonization. Plant succession hydrosere and xerosere. Plant adaptations – morphological and anatomical features – hydrophytes, xerophytes, epiphytes and parasites. Environmental pollution: Atmospheric

pollution- Air pollution, Soil Pollution, Water pollution, Noise pollution and radioactive pollution.

Unit – IV **(12 Hours)**

Phytogeography: Range - Dispersal and migration barriers hypothesis, Continental drift Hypothesis and Age and Area hypothesis, Endemism, Hotspots. Continuous and discontinuous Distribution of Plants. Phytogeographical regions in India. Vegetations of India.

Unit – V **(12 Hours)**

Conservation Biology - Introduction – Ecosystem approaches - Social approaches - Chipko movement. *In situ* conservation (Afforestation, Social Forestry, Agro Forestry and National parks and Sanctuaries) and *ex situ* conservation (Cryopreservation, Gene Banks, DNA Banks). Environmental Education.

Text Book:

1.Sharma, P. D. 2009. Ecology and Environmental, Rastogi Publishers, Meerut.

Reference Books:

1. Edward J. Kormondy. 1996. Concept of Ecology, Prentice Hill of India Private Limited, New Delhi.
2.Bhatia, K. N. 2005. A Treatise on Plant Ecology, Pradeep Publications, Jalandhar.
3. Sharma, J. P. 2004. Environmental Studies, Lakshmi Publications Private Limited, New Delhi.
4. Shukla, R.S. Chandel, I.P.S. 2011. Plant Ecology and Soil Science, S. Chand and Company, Chennai.
5. Krishnamurthy, K. V. (2006). An Advanced Textbook on Biodiversity: Principles and Practice. Oxford and IBH Publishing Company Private Limited, New Delhi.

Web References:

1. https://byjus.com/biology/ecosystem
2. https://byjus.com/biology/air-pollution-control
3. https://byjus.com/biology/what-is-in-situ-and-ex-situ-conservation-of-biodiversity

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

Core Major Practical VI (For Core Course XIII & XIV)
(Plant Physiology and Biochemistry and Plant Ecology, Phyto-geography, Conservation Biology) – 20U6BOCP06

Plant Ecology, Phytogeography and Conservation Biology:

1. Study of Plant Communities – Simple Quadrat.
2. Study of the Morphological and Structural adaptation of hydrophytes, xerophytes, epiphytes and parasites to correlate to the particular habitat.
3. Phytogeographical regions in India, Types of forest and Vegetation. Types of Ecosystem.

Plant Physiology and Biochemistry:

For demonstration only:

1. Anaerobic respiration (Mercury experiment)
2. Demonstration of Hill reaction.
3. Effect of scarification on seed germination.
4. Demonstration of gravitropism using Klinostat.

To be performed by each student:

1. Effect of temperature and chemicals on membrane permeability.
2. Determination of DPD by plasmolytic method using onion/Rheo leaf.
3. Separation of plant pigments by paper chromatography
4. Determination of absorption and transpiration ratio of twigs.
5. Measurement of respiration rate using germinating seeds and flower buds with simple respiroscope.
6. Determination of photosynthetic rate in water plants under different CO_2 concentrations using Wilmott's bubbler.
7. Measurement of oxygen evolution under different coloured lights using Wilmott's bubbler.
8. Effect of light intensity on transpiration using Ganong's photometer.

Model practical question paper for B.Sc., Botany Degree Examination

Core Major Practical VI (For Core Course XIII & XIV)

(Plant Ecology, Phyto-geography, Conservation Biology, Plant Physiology and Biochemistry)

20U6BOCP06

Time: 3 Hrs **Maximum: 60 marks**

Practical : 50 marks

Record : 10 marks

1. Outline the procedure, apparatus and materials required for investigating the physiological problem **A** assigned. Set up the experiment. Tabulate the data obtained and report the results. Leave the set up for valuation. **(1×15=15)**
2. Construct a simple quadrat **B.** Study the plant community and analyse the vegetation. **(1×7=7)**
3. Based on morphological and anatomical characters, assign **C** and **D** to their respective probable habitats. Draw suitable diagrams. Submit slides for valuation. **(2×6=12)**
4. Draw and comment on the set up **E.** **(1×4=4)**
5. Write a comment on **F**, **G**, **H** and **I**. **(4×3=12)**

Key:

A - Plant physiology individual experiments

B - Plant Ecology

C and **D** - Plant Ecology

E - Plant physiology demonstration

F, G, H and **I** - Plant physiology/ Biochemistry/ Plant Ecology/ Phyto-geographical regions/Conservation Biology

SEMESTER VI

Core course XV- Mini - Group - Project Work – 20U6BOPR01

5 Credits /6 Hours/Week

Project is a component of the active learning module that teaches approach and research techniques. Students would have a hand on experience in investigating a selected research problem where she shall be trained in framing and testing hypothesis through suitable research design. Students are required to select their research topic in the one of the following domain.

Allocation:

- Students may select their broad research area during the end of the fourth semester and will be guided by a suitable research supervisor in the area allotted by the Head of the Department.
- Each research supervisor may be allotted based on the number of students.
- Summer vacation may be used by the students to initiate their project work.

Objective of the study:

- Topic investigated will have defined area of study.
- Project students will have hands on experience in all the basic instruments and techniques to conduct her original research.
- Minimum of 3 years of literature will be added in the review with recent publication of the year.

Evaluation:

- Interim reports should be submitted by the students during the mid of sixth semester to the Head of the Department. This interim report should form the basis for the final project report. (Change in project work after the submission of interim report may be carried out only with prior permission of the HOD).
- Even research is carried out as a group, individual students will be evaluated.
- Evaluation will be based on the norms that will look into nature of the project work, the content of the dissertation, presentation duly summed up by a viva-voce examination.
- Attendance of the student for presentation and viva-voce is a must.

Dissertation format:

- Introduction
- Review of literature
- Materials and methods
- Results
- Discussion
- Summary
- Bibliography

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U6BOE02A	Title	Batch	2020 -2023
Hours/Week	04	Ethnobotany, Medicinal Plants and their Utilization	Semester	VI
			Credits	03

Course Objective

- To study the ethnobotany, various systems of Indian medicines, drug classification, drug adulteration, drug evaluation, cultivation of selected medicinal plants and certain important drugs.

Course Outcomes (CO)

K1	CO1	To remember the ethnic communities of India and Tamil Nadu and methods to study ethnobotany.
K2	CO2	To understand the various Indian system of medicines and classification, adulteration and evaluation of drugs.
K3	CO3	To acquire knowledge on application of ethnobotany.
K4	CO4	To analyze the various therapeutical uses of medicinal plants.
K5	CO5	To evaluate the mode of action of various drugs acting on central nervous system, gastrointestinal tract and cardio vascular systems.

Unit - I **(12 Hours)**

Ethnobotany: Definition; Ethnobotany in India, Ethnic communities of India and Tamil Nadu. Modern Ethnobotany. Methods to study ethnobotany; Applications of Ethnobotany: Palaeo-ethnobotany. Folk medicines of ethnobotany, ethnomedicine and ethnoecology. Application of ethnomedicine to certain diseases- jaundice, diabetics, blood pressure and skin diseases.

Unit - II **(12 Hours)**

History, Scope and Importance of Medicinal Plants. Indian systems of Medicine: Siddha. Ayurvedha and Unani. Classification of crude drugs (Alphabetical, morphological, chemical, biological, pharmacological and chemotaxonomical). Ethnobotanical approach to pharmaceutical drug.

Unit - III **(12 Hours)**

Cultivation methods of medicinal plants – vegetative, asexual, sexual and tissue culture techniques. Drug adulteration. Drug evaluation – morphological or organoleptic, microscopic physical and chemical methods.

Unit - IV **(12 Hours)**

Cultivation, macro and microscopic characters, chemical constitutions and therapeutic uses of drugs from root (*Withania*), drugs from bark (*Cinchona*), drugs from stem of wood (*Ephedra*), drugs from underground stem (*Turmeric*), drugs from leaf (*Plectranthus*), drugs from flower (*Eugenia*), drugs from fruit (*Citrus*) and drugs from seeds (*Trigonella*).

Unit - V **(12 Hours)**

A brief account on drugs acting on central nervous system (Analgesics, CNS stimulants, CNS depressants and Hallucinogenics). Drugs used in disorders of gastrointestinal tract (Carminatives, emetics, Bulk laxatives and Purgatives) and cardio vascular drugs (Cardiotonics, Cardiac depressants and Antihypertensives).

Text Book:

1. Arumugam, K. R. and Murugesh, N. 2003. Text Book of Pharmacognosy. Sathya Publishers, Madurai.

Reference Books:

1. Bhattacharya, A. K. and Hansda, R. 2003. Hand book of Medicinal Plants. Pointer Publishers, Jaipur.
2. Wallis, T. E. 1997. Text book of Pharmacognosy. C.B.S. Publishers and Distributors, New Delhi. Gokhale, S. B., Kokate, C. K. and Purohit, A. P. 2010. Pharmacognosy, Nirali Prakashan, Pune.
3. Purohit and Vyas. 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd Edition, Agrobios Publication, Jodhpur.
4. Ravindra Sharma. 2003. Medicinal Plants of India (An Encyclopedia), Daya Publishing House, New Delhi.
5. Trivedi, P. C. 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios Publication, Jodhpur.

Web References:

1. https://timesofindia.indiatimes.com/topic/Ethnic-groups-of-Tamil-Nadu
2. https://main.ayush.gov.in/sites/default/files/Introduction_2.pdf
3. https://www.slideshare.net/diptisorte/drugs-acting-on-gi-system

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	20U6BOE02B	Title	Batch	2020 -2023
Hours/Week	04	Biofertilizers	Semester	VI
			Credits	03

Course Objective

- To study the basic principles of biofertilizer and national economy.

Course Outcomes (CO)

K1	CO1	To remember the properties of soils, soil microorganisms, soil flora and soil fauna.
K2	CO2	To understand the small scale and large scale production of Cyanobacterial biofertilizers.
K3	CO3	Application of *Rhizobium* and *Azospirillum* inoculants.
K4	CO4	To analyze the isolation and identification of Phosphate Solublizing Microorganisms.
K5	CO5	To evaluate the role of vermicompost and green manure on soil fertility.

Unit - I **(8 Hours)**

Biofertilizers - Introduction, History, definition Importance of Biofertilizers- ecofarming. Chemical fertilizers – Introduction – Definition - hazardous effect – Components of soil- Mineral particles, Humus, soil atmosphere, soil water and biological system. Properties of soils – Physical properties, chemical properties - acid soils – saline and alkaline. Soil microorganisms - soil flora, soil fauna and role of soil organisms.

Unit – II **(7 Hours)**

Cyanobacteria as Biofertilizer – Inoculum preparation – small scale and large scale production. Factors affecting cyanobacterial growth. *Azolla* as Biofertilizer and other uses, Morphology and life cycle of *Azolla* and *Anabaena – azollae,* Nitrogen fixation by *Azolla,* Growth rate and Nitrogen input Factors affecting the growth of *Azolla,* Decomposition of *Azolla* and mobilization of its nitrogen, Methods of *Azolla* utilization, Control of insects and diseases.

Unit – III **(7 Hours)**

Rhizobium inoculants– Classification - Plant tests, Maintenance of culture, Cultivation and mass production, Quality control, Methods of inoculation. *Azospirillum* inoculants, Isolation of *Azospirillum* from rice root. Identification and classification, Maintenance and cultivation, Crop response.

Unit - IV **(7 Hours)**

Isolation of Phosphate – Solubilizing Microorganisms –*Pseudomonas, Bacillus* - Quantitative measurement of phosphate solubilization in culture medium, Agronomic Aspects. Mycorrhiza - Isolation and identification of Ectomycorrhizal fungi, Inoculation Technique for Ectomycorrhizal Fungi. Isolation of VAM fungal spores, Inoculum production of VAM Fungi, Field Response.

Unit - V **(7 Hours)**

Soil Fertility-Vermi Compost, Green Manure, Source of Natural Nitrogen in Rice Soil, Legume Green Manure, Stem Nodulating Green Manure, Green Manuring in India – Limitations. Organic Matter Decomposition. Vermiculture – Introduction, production and significance of vermicompost.

Text Book:

1. Lampkin, N. 1990. Organic Farming. Press Books, Ipswich, United Kingdom.

Reference Books:

1. Palaniappan, S. P. and Annadurai, K. 1999. Organic Farming – Theory and Practice. Scientific Publishers, Jodhpur.
2. Reddy M. V. 1995. Soil Organisms and Litter Decomposition in the Tropics. Oxford and IBH Publishing Company Limited, New Delhi.
3. Sharma, A. 2002. Hand Book of Organic Farming. Agrobios, Jodhpur.
4. Singh, S. P. 1994. Technology for Production of Natural Enemies. PDBC, Bangalore.
5. Subba Rao, N.S. 2002. Soil Microbiology. Oxford & IBH Publishing Company Limited, New Delhi.

Web References:

1. https://biocyclopedia.com/index/biotechnology/plant_biotechnology/biofertilizers/biotech_blue_green_algae.php
2. https://eap.mcgill.ca/publications/EAP51.htm
3. https://www.ecomena.org/vermicomposting

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√
CO5	√	√	√	√	√