VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

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

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

DEPARTMENT OF BOTANY

BACHELOR OF SCIENCE

SYLLABUS & REGULATIONS

CANDIDATES ADMITTED FROM 2018 -19

ONWARDS UNDER OBE AND CBCS PATTERN

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

ANGAMMAL EDUCATIONAL TRUST

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(AUTONOMOUS – 2018-2019)

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Accredited By NAAC, ISO 9001:2008 Affiliated to Periyar University - Salem 11

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 development in all aspects of work.	K5

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 2018 – 2019 Onwards Under OBE and CBCS Pattern

1. Scope of the Department

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 Morphology, Taxonomy, Anatomy, Embryology, Plant Pathology, Physiology, Ecology, Plant Diversity, Ethnobotany, Genetics, Biotechnology, Plant Physiology, Biochemistry, Horticulture, Medicinal Plants, Organic Farming, 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 students in growing various horticultural plants thereby to raise a nursery.
- To motivate self-employment by knowledging and practicing in the preparation of bio-fertilizers.
- '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 TRB 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 - I
2. Foundation English - I
3. Core Course I – Plant Diversity –I
4. Core Course II Practical I - Carried over to II Semester
5. First Allied Paper I - Zoology
6. First Allied II --Practical - Carried over to II Semester
7. Value Education - Yoga

Semester II

8. Foundation Tamil – II
9. Foundation English - II
10. Core Course III – Plant Diversity -II
14. Core Course II- Practical –I Comprising Core Course I & III
15. First Allied Paper II - Zoology
13. First Allied II Practical - Cont. from I Semester
14. Value Education – Environmental Studies.

Semester III

15. Foundation Tamil - III
16. Foundation English - III
17. Core Course IV – Mushroom Cultivation Technology
18. Core Course V - Practical II - Carried over to IV Semester
19. Second Allied Paper I - Chemistry
20. Second Allied II Practical - Chemistry

21. SBEC I – Economic Botany/Plants and People
22. NMEC I – Industrial Chemistry/Water Quality Analysis

Semester IV

23. Foundation Tamil - IV
24. Foundation English - IV
25. Core Course VI - Anatomy, Embryology and Seed Science
26. Core Course V - Practical II. Comprising Core Course IV & VI.
27. Second Allied Paper II - Chemistry
28. Second Allied Practical II Chemistry. Cont. from III Semester
29. SBEC II – Fundamentals of Microbiology and Plant pathology/Biopesticides
30. NMEC II - Apiculture

Semester V

31. Core Course VII – Morphology and Taxonomy of Angiosperms.
32. Core Course VIII - Cell Biology and Genetics
33. Core Course IX – Plant Ecology, Phytogeography and Conservation Biology
34. Core Course X - Practical III.*
35. Core Course XI - Practical IV.*
36. Elective I - Plant Breeding and Evolution/Intellectual Property Rights
37. SBEC III - Horticulture and Nursery Management/Stress Biology
38. SBEC IV – Forest Botany/Floriculture

Semester VI

39. Core Course XII - Plant Physiology and Biochemistry
40. Core Course XIII – Group Project (Minor)
41. Core Course X - Practical III (For Core Course VII – Morphology and Taxonomy of Angiosperms, Core Course VIII - Cell Biology and Genetics and from V Semester)
42. Core Course XI - Practical IV (For Core Course XII - Plant Physiology and Biochemistry & Core Course IX - Plant Ecology, Phyto-geography and Conservation Biology)
43. Elective II – Ethnobotany, Medicinal Plants and their Utilization/Biostatistics
44. Elective III - Plant Biotechnology, Microscopy and Micro-technique/Bioinformatics
45. SBEC V – Biofertilizers/Plants and Human Welfare
46. SBEC VI – Herbal Home Remedies/Plant Resources
47. Extension Activities.

6. Examination:

The theory 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. The practical examination is also of three hours duration at the end of even semester. 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
Test - 5 Marks
Model - 10 Marks

Total - 25 Marks

Internal Assessment Marks for Practical papers are as follows

Attendance -10 Marks
Observation -10 Marks
Test - 20 Marks

Total - 40 Marks

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 % to 74.9 %.

7. 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 2018 - 2019 Onwards)

Sem	Part	Course	Code	Title	Inst. Hrs.	Credits	Exam Hrs.	Marks		
								CIA	EA	Total
I	I	Tamil I	18U1LT01	Foundation Tamil I	6	3	3	25	75	100
	II	English I	18U1LE01	Foundation English I	6	3	3	25	75	100
	III	Core Course I	18U1BOC01	Plant diversity –I (Algae, Fungi and Lichens)	5	5	3	25	75	100
		Core Course II (Practical)	18U2BOCP01	Algae, Fungi and Lichens (Examination at the end of II Semester)	4	-	-	-	-	-
		First Allied I	18U1ZOA01	Zoology I	4	4	3	25	75	100
		First Allied II (Practical)	18U2ZOAP01	Zoology	3	-	-	-	-	-
	IV	Value Education	18U1VE01	Yoga	2	2	3	25	75	100
				Total	**30**	**17**	**-**	**125**	**375**	**500**
II	I	Tamil II	18U2LT02	Foundation Tamil II	6	3	3	25	75	100
	II	English II	18U2LE02	Foundation English II	6	3	3	25	75	100
	III	Core Course III	18U2BOC02	Plant diversity – II (Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)	5	5	3	25	75	100
		Core Course II (Practical)	18U2BOCP01	Cont. From I Semester Comprising Core Course I – Algae, Fungi and Lichens & Core Course III - Bryophytes, Pteridophytes, Gymnosperms and Paleeobotany	3	3	3	40	60	100
		First Allied III	18U2ZOA02	Zoology II	4	4	3	25	75	100
		First Allied II (Practical)	18U2ZOAP01	Allied Zoology practical Cont. From I Semester	3	3	3	40	60	100
	IV	Value Education	18U2ES01	Environmental Studies	3	4	3	25	75	100
				Total	**30**	**25**	**-**	**205**	**495**	**700**

III	I	Tamil III	18U3LT03	Foundation Tamil III	6	3	3	25	75	100
	II	English III	18U3LE03	Foundation English III	6	3	3	25	75	100
	III	Core Course IV	18U3BOC03	Mushroom cultivation Technology	4	5	3	25	75	100
		Core Course V (Practical)	18U3BOCP02	Core Course IV Mushroom cultivation Technology (Examination at the end of IV Semester)	3	-	-	-	-	-
		Second Allied I	18U3CHA01	Chemistry I	4	4	3	25	75	100
		Second Allied II Practical	18U3CHAP01	Chemistry	3	-	-	-	-	-
	IV	SBEC I	18U3BOS01A/B	Elected by students	2	2	3	25	75	100
		NMEC I	18U3BON01	Elected by students	2	2	3	25	75	100
				Total	**30**	**19**	**-**	**150**	**450**	**600**
IV	I	Tamil IV	18U4LT04	Foundation Tamil IV	6	3	3	25	75	100
	II	English IV	18U4LE04	Foundation English IV	6	3	3	25	75	100
	III	Core Course VI	18U4BOC04	Anatomy, Embryology and Seed Science	4	5	3	25	75	100
		Core Course V (Practical)	18U4BOCP02	Comprising Core Course IV Mushroom cultivation Technology & Core Course VI - Anatomy, Embryology and Seed Science Carried From III Semester	3	3	3	40	60	100
		Second Allied III	18U4CHA02	Chemistry II	4	4	3	25	75	100
		Second Allied II Practical	18U4CHAP01	Chemistry	3	3	3	40	60	100
	IV	SBEC II	18U4BOS02A/B	Elected by students	2	2	3	25	75	100
		NMEC II	18U4BON02	Elected by students	2	2	3	25	75	100
				Total	**30**	**25**	**-**	**230**	**570**	**800**
V	III	Core Course VII	18U5BOC05	Morphology and Taxonomy of Angiosperms	5	5	3	25	75	100
		Core Course VIII	18U5BOC06	Cell Biology and Genetics	5	5	3	25	75	100
		Core Course IX	18U5BOC07	Plant Ecology, Phytogeography and Conservation Biology	4	4	3	25	75	100
		Core Course X (Practical)	18U6BOCP03	For Core Course VII- Morphology and Taxonomy of Angiosperms (Examination at the end of VI Semester)	3	-	-	-	-	-

		Core Course X (Practical)	18U6BOCP03	For Core Course VIII - Cell Biology and Genetics (Examination at the end of VI Semester)	3	-	-	-	-	-
		Core Course X (Practical)	18U6BOCP03	For Core Course IX - Plant Ecology, Phytogeography and Conservation Biology (Examination at the end of VI Semester)	2	-	-	-	-	-
		Elective I	18U5BOE01A/B	Elected by students	4	4	3	25	75	100
		SBEC III	18U5BOS03A/B	Elected by students	2	2	3	25	75	100
		SBEC IV	18U5BOS04A/B	Elected by students	2	2	3	25	75	100
				Total	**30**	**22**	**-**	**150**	**450**	**600**
VI	III	Core Course XI	18U6BOC08	Plant Physiology and Biochemistry	6	5	3	25	75	100
		Core Course XII	18U6BOPR01	Group project	6	5	3	25	75	100
		Core Course X (Practical)	18U6BOCP03	For Core Course VII- Morphology and Taxonomy of Angiosperms, Core Course VIII- Cell Biology and Genetics.	-	3	3	40	60	100
		Core Course XIII (Practical)	18U6BOCP04	For Core Course XI - Plant Physiology and Biochemistry& Core Course XII - Plant Ecology, Phytogeography and Conservation Biology	4	4	3	40	60	100
		Elective II	18U6BOE02A/B	Elected by students	4	4	3	25	75	100
		Elective III	18U6BOE03A/B	Elected by students	4	4	3	25	75	100
		SBEC V	18U6BOS05A/B	Elected by students	2	2	3	25	75	100
		SBEC VI	18U6BOS06A/B	Elected by students	2	2	3	25	75	100
		Extn. Activity	18U6EX01	-	-	1	-	-	-	-
				Total	**30**	**32**	**-**	**230**	**570**	**800**
					170	**140**	**-**	**4000**		

Skill Based Elective Courses:

SBEC – I – Economic Botany/Plants and People

SBEC – II – Fundamentals of Microbiology and Plant Pathology/Biopesticides

SBEC – III – Horticulture and Nursery Management/Stress Biology

SBEC – IV – Forest Botany/Floriculture

SBEC – V – Biofertilizers/Plants and Human Welfare

SBEC – VI – Herbal Home Remedies/Plant Resources

Elective Courses:

Elective – I – Plant Breeding and Evolution/Intellectual Property Rights

Elective – II – Ethnobotany, Medicinal Plants and their Utilization/Biostatistics

Elective – III – Plant Biotechnology, Microscopy and Microtechnique/Bioinformatics

8. Question Paper Pattern for B.Sc., Botany Course

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

PART – A (20 x 1 = 20 Marks)
(*Answer all questions*)

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. 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 the university examination 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 University 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.

Candidate who does not obtain the required minimum marks for a pass in a paper shall be required to appear and pass the same at a subsequent appearance.

10. 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.

11. Maximum duration for the completion of the UG Programme

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

12. Commencement of this regulation

These regulations shall take effect from the academic year 2018- 19, i.e., for students who are to be admitted to the first year of the course during the academic year 2018-19.

13. Transitory Provision

Candidates who were admitted to the UG course of study before 2018-19 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 2019. 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	18U1BOC01	Title	Batch	2018 -2021
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 and understand various trends of classification of algae, fungi and lichens.
K2	CO2	To understand the thallus organization and characteristics features of lower group of plants.
K3	CO3	The application of algae, fungi and lichens for the production of various industrial based products.
K4	CO4	To analyze the algae and fungi incorporated in the syllabus for their cultivation and production.

Algae

Unit - I **(15 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 production of Agar Agar, Carrageenin and Algal Biofertilizer (BGA). Algae as indicators of pollution.

Unit - II **(15 Hours)**

Study of the structure, reproduction and lifecycle of the following genera: *Oscillatoria, Chlamydomonas, Oedogonium, Caulerpa, Sargassum* and *Polysiphonia*.

Fungi

Unit - III **(15 Hours)**

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 Yeast and *Penicillium* in industries.

Unit - IV **(15 Hours)**

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

Unit - V

Lichens **(15 Hours)**

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

Text Books:

1. Text Book of Algae. 2018. K. S. Bilgrami and L. C. Saha. Ist Edition, CBS Publishers, New Delhi.
2. Text Book of Algae. 2011. O. P. Sharma. Tata McGraw-Hill Publications, New Delhi.
3. Advances in Mycology. 2012. Sohan Sharma. Random Publications Publishers and Distributors, New Delhi.
4. A Text Book of Algae. 1976. Kumar H. D. and Singh H. N. East West Press Private Limited, New Delhi.
5. Lichens - A Preliminary Text Book. 1970. Mishra A. and Agarwal R. P. Oxford and IBH Publishing Company, Mumbai.
6. An Introduction to Fungi. 1970. Srivastava J. P. Central book Depot, Allahabad.
7. A Text Book of Fungi, Bacteria and Viruses. 1978. Dubey H. C. Vikas Publishing House Private Limited, New Delhi.

Reference Books:

1. Introductory Mycology. 2007. C. J. Alexopoulos, C. W. Mims, M. Blackwell. John Wiley, New York.
2. Botany for Degree student – Algae. 2010. Vashishta B. R. and A. K. Sinha, V. P. Singh. S. Chand and Company, New Delhi.

Mapping

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

Core Practical

For students admitted from the academic year 2018 – 2019

Core Major Practical I (Core Course II) 18U2BOCP01

Plant Diversity-I (Algae, Fungi and Lichens)

Algae:

1. Study the vegetative and reproductive structures of *Oscillatoria, Chlamydomonas, Oedogonium, Caulerpa, Sargassum* 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.

SEMESTER I

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U1BOA01	Title	Batch	2018 -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 *Marchantia, 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 gain knowledge on the reproduction patter of lower group of plants.
K2	CO2	To understand the general characters of lower cryptogams.
K3	CO3	To apply the economic importance of algae and fungi.
K4	CO4	To analyze metabolic reactions in plants.

Unit - I **(12 Hours)**

Thallophytes

Algae

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

Unit - II **(12 Hours)**

Fungi

General characters of fungi. Study of 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- *Marchantia, 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.

Unit - V **(12 Hours)**

Plant ecology

Climatic factors, morphological and anatomical adaptations in hydrophytes and xerophytes.

Text Books:

1. Text book of Algae. 2018, K. S. Bilgrami and L. C. Saha, Ist Edition, CBS Publishers.
2. Algae O. P. Sharma 2011, Tata McGraw-Hill Education.
3. Advances in Mycology, *2012Sohan Sharma.* , Random Publications Publishers and Distributors, New Delhi.
4. B.P. Pandey 2011, A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany, S. Chand Limited
5. Pandey, B. P. 1986. Text book of Botany, Vol. I & II. S. Chand & Co. New Delhi.
6. Fuller, H. J. and Tippo, O. 1949. College Botany, Henry Holt & Company.
7. Ganguly, A. K. 1975. General Botany Vol. I (1971) and Vol. II. The new book stall, Calcutta.

Reference Books:

1. Vashishta B. R. A. K. Sinha. 2010. Botany for Degree student – Fungi. S. Chand & Co. New Delhi.
2. Pandey, S. N., Mishra. S.P and Trivedi P.S. 2009, A text book of Botany, Volume II , Vikas Publishing House Pvt. Ltd., Delhi.
3. Rao, K. N., Krishnamoorthy, K. V. and Rao, G. S. 1979. Ancillary Botany. S. Viswanathan Pvt., Madras.

Mapping

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

SEMESTER II

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U2BOC02	Title	Batch	2018 -2021
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 gain insight knowledge on the bryophytes, pteridophytes, gymnosperms and palaeobotany.
K2	CO2	To understand the internal structures and life cycle patterns of bryophytes, pteridophytes and gymnosperms.
K3	CO3	To familiarizes the economic importance of bryophytes and pteridophytes.
K4	CO4	To analyze the fossil and fossilization methods of pteridophytes and gymnosperms.

Unit - I

Bryophytes: **(15 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: **(15 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.

Unit - III **(15 Hours)**

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

Unit - IV

Gymnosperms: (15 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: (15 hrs)

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

Text books:

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.
2. Vashishta, P. C., Sinha. A. and Anil Kumar. 2009. Botany for Degree Students,- Pteridophyta. S. Chand and Company Private Limited, New Delhi.
3. Vashishta B. R. 1983. Botany for Degree student – Bryophyta. S. Chand and Company Private Limited, New Delhi.
4. Pandey, B.P.1997. A text book of Bryophyta, Pteridophyta and Gymnosperms. K. Nanth and Company, Meerut.
5. Shukla, A.C. and Mishra, S. P. 1982. Essentials Palaeobotany, Vikas Publishing House Private Limited, New Delhi.

Reference Books:

1. Smith, G.M. 1935. Cryptogamic Botany. Vol. – III. Tata McGraw Hill Publishing Company, New Delhi.
2. Arnolds, C.A. 1947. An Introduction to Palaeobotany. McGraw Hill Book Company, New York.
3. Sporne. K. R. 1991. The Morphology of Gymnosperms. B.I. Publications Private Limited, Mumbai.
4. Shukla, A. C. and Sharma, M. 1992. Plant fossils - A link with the past. Birbal Shani Institute Palaeobotany, Lucknow, India.

Mapping

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

Core Practical

For students admitted from the academic year 2018 – 2019

Core Major Practical I (Core Course III) 18U2BOCP01

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* 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 two days to acquire knowledge on Plant Diversity – I and II.

Core Practical

Model Question Paper B.Sc., Botany Degree Examination

For Students Admitted from the academic year 2018 – 2019

Core Major Practical I (For Core Course I & III)

Plant Diversity - I & II

(Paper code: 18U2BOCP01)

(Algae, Fungi and Lichens, 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)**

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

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

(Identification – 2, Notes – 1 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. Identify and write notes on the economic importance of **J**. **(2×1=2)**

(Identification – 1 and Uses – 1)

Key:

1. Sectioning:

A – Algae or Fungi

B – Bryophytes or Pteridophytes

C – Gymnosperms

2. Spotters - Permanent slides

D – Algae or Fungi

E – Bryophytes or Pteridophytes

F – Gymnosperms or Lichens

3. Spotters – Morphology

G– Algae or Fungi

H – Bryophytes or Pteridophytes

I – Gymnosperms or Palaeobotany

4. Spotters – Economic importance

J - Algae or Fungi

SEMESTER II

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U2BOA02	Title	Batch	2018 -2021
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.

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**.**

Unit - II **(12 Hours)**

Taxonomy:

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

Unit - III **(12 Hours)**

Cytology and Genetics:

Cytology: Structure of plant cell and brief outline of the following cell organelles: Endoplasmic Reticulum, 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.

Unit -V **(12 Hours)**

Embryology:

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

Text Books:

1. Pandey, B. P. 2011. Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany. S. Chand and Company Private Limited, New Delhi.
2. Pandey, B. P. 2001. Plant anatomy. S. Chand and Company Private Limited, New Delhi.
3. Sumitra Sen and Dipak Kumar Kar. 2006. Cytology and Genetics. Narosa Publishing House Private Limited, New Delhi.
4. Sundararajan, S. 2000. Cytogenetics. Anmol Publications Private Limited, New Delhi.
5. Verma, P. S. and Agarwal, V. K. 2008. Cytology. 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. Sambamurthy, A. V. S. S. 1999. Genetics. Narosa Publishing House, New Delhi.

Mapping

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

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

For Students Admitted from the academic year 2018 – 2098

First Allied Practical - I (For Allied Course I & III)

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.

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 and monocot root and stem.

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 2018 – 2019

First Allied Practical I (For Allied Course I & III)

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 – 1 and Reasons -4)

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.** **(5×2=10)**

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

4. Write critical notes on **J, K, L** and **M.** **(3×4=12)**

(Identification -1 and Notes – 2)

5. Comment on the setup **N** **(3×1=3)**

Key:

Family Identification:

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

Spotters – Economic Importance:

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

Section:

H – Anatomy

I – Gymnosperms

Spotters – Permanent slides:

J – Algae or Fungi

K – Bryophytes or Pteridophytes

L – Cytology or Genetics

M – Embryology or Plant Ecology

Physiology experimental setup:

N – Physiology Experiment.

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U3BOC03	Title	Batch	2018 -2021
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 obtain knowledge on morphology, habitats and differentiation of mushrooms.
K2	CO2	Gaining knowledge on compost preparation, spawn preparation and storage of spawn.
K3	CO3	Familiarizing the cultivation of button, oyster and straw mushroom.
K4	CO4	To analyze the marketing and nutrient profile of mushrooms.

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. Nutrient profile and health benefits of mushroom.

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.

Unit - III **(12 Hours)**

Principles of composting, machinery required for compost making, materials for compost preparation. Methods of Composting – Long Term and Short Term method.

Unit - IV **(12 Hours)**

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 - V **(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.

Text Books:

1. Pandey, R. K. and S. K. Ghosh. 2012. A Hand book of Mushroom cultivation. Emkay Publications, New Delhi.
2. Tripathi, D. P. 2005 Mushroom Cultivation, Oxford and IBH Publishing Company Private Limited, New Delhi.
3. Verma, R.N. and B. Vijay. 2006. Recent advances in the cultivation technology of edible mushrooms.

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.

Mapping

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

Core Practical

For Students Admitted from the academic year 2018 – 2019

Mushroom Cultivation Technology Practical (18U4BOCP02)

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.

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U3BOS01A	Title	Batch	2018 -2021
Hours/Week	2	Economic Botany	Semester	III
			Credits	02

Course Objective

- To study the botanical description, cultivation, harvesting and uses of cereals, pulses, vegetables, fruits, spices beverages and fatty oil yielding plants.

Course Outcomes (CO)

K1	CO1	To obtain knowledge on cultivation, harvesting and uses of selected cereals, pulses, fruits and spices.
K2	CO2	Gaining knowledge on botanical description and economic importance of beverage plants.
K3	CO3	Familiarizing the technical aspects of cultivation and harvesting of selected cereals, pulses, fruits and spices.
K4	CO4	To analyze the cultivation of economically important plants.

Unit - I **(7 Hours)**

Botanical description, cultivation, harvesting and uses of cereals (Wheat, Rice, Maize and Sorghum) and legumes (Black gram, Red gram and Chick pea).

Unit - II **(7 Hours)**

Botanical description and economic importance of vegetables (Potato, Cassava and Tomato) and fruits (Banana, Grapes, Citrus and Mango).

Unit - III **(7 Hours)**

Botanical description, cultivation and uses of spices (Ginger, Pepper, Cardamom and Clove) and condiments (Chilly, Coriandrum and Turmeric).

Unit - IV **(7 Hours)**

Botanical description, cultivation, processing and uses of beverage plants: Tea, Coffee and Cocoa. Sugars and Starch: Sugarcane and Manihot. Fibers and Timber: Cotton and Teak.

Unit - V **(8 Hours)**

Botanical description, harvesting, extraction and uses of fatty oils and vegetable fats: Sun flower, Peanut, Palm Oil, Coconut and Gingelly. Medicinal Plants: Rauwolfia, Aconitum, Saraca and Neem.

Text Books:

1. Pandey, B. P. Economic Botany. 2012. S. Chand and Company Limited, New Delhi. Fourth Edition.
2. Rashtra Vardhana. Economic Botany. 2009. Arup Book Publishers Private Limited, New Delhi, First Edition.
3. Verma, V. A. Textbook of Economic Botany. 1980. Emkay Publications, New Delhi, Third Edition.
4. Maheshwari, P. and U. Singh. 1965. Dictionary of Economic plants in India. ICAR, New Delhi.

Reference Books:

1. Hill, A. F. Economic Botany. 1952. Textbook of useful plants and plant products. McGraw-Hill Book Company, New York, Second Edition.
2. Thompson, H. C. 1949. Vegetable Crops. McGraw-Hill Book Company, New York, Fourth Edition.
3. Wallis, T. E. 1946. Text book of pharmacognosy. J. and A. Churchill Limited, London.

Mapping

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

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U3OS01B	Title	Batch	2018 -2021
Hours/Week	02	Plants and People	Semester	III
			Credits	02

Course Objective

- To study the various uses of plants with respect to human well being.

Course Outcomes (CO)

K1	CO1	To remember the plant diversity.
K2	CO2	To learn the management of plant diversity.
K3	CO3	To understand the importance plants.
K4	CO4	To apply technical aspects of maintaining plant biodiversity.

Unit–I **7 Hours**

Biodiversity - Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication.

Unit–II **7 Hours**

Plant diversity its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agro biodiversity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies forvaluation, Uses of plants.

Unit–III **7 Hours**

Loss of Biodiversity - Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agro biodiversity, projected scenario for biodiversity loss, management of plants.

Unit–IV **7 Hours**

Conservation of Biodiversity - Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation, Social

approaches to conservation, Biodiversity awareness programmes, Sustainable development.

Unit–V **8 Hours**

Uses of plants with respect to human well being - Importance of forestry their utilization and commercial aspects, Avenue trees, Ornamental plants of India, Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.

Text Books:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
2. Verma, V. A. Textbook of Economic Botany. 1980. Emkay Publications, New Delhi, Third Edition.
3. Maheshwari, P. and U. Singh. 1965. Dictionary of Economic plants in India. ICAR, New Delhi.

Mapping

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

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Chemistry)	
Course Code	18U3BOA01	Title	Batch	2018 -2021
Hours/Week	5	Allied Botany - I	Semester	III
			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 *Marchantia, 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 gain knowledge on the reproduction patter of lower group of plants.
K2	CO2	To understand the general characters of lower cryptogams.
K3	CO3	To apply the economic importance of algae and fungi.
K4	CO4	To analyze metabolic reactions in plants.

Unit - I **(12 Hours)**

Thallophytes

Algae

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

Unit - II **(12 Hours)**

Fungi

General characters of fungi. Study of 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- *Marchantia, 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.

Unit - V **(12 Hours)**

Plant ecology

Climatic factors, morphological and anatomical adaptations in hydrophytes and xerophytes.

Text Books:

8. Text book of Algae. 2018, K. S. Bilgrami and L. C. Saha, Ist Edition, CBS Publishers.
9. Algae O. P. Sharma 2011, Tata McGraw-Hill Education.
10. Advances in Mycology, *2012Sohan Sharma.* , Random Publications Publishers and Distributors, New Delhi.
11. B.P. Pandey 2011, A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany, S. Chand Limited
12. Pandey, B. P. 1986. Text book of Botany, Vol. I & II. S. Chand & Co. New Delhi.
13. Fuller, H. J. and Tippo, O. 1949. College Botany, Henry Holt & Company.
14. Ganguly, A. K. 1975. General Botany Vol. I (1971) and Vol. II. The new book stall, Calcutta.

Reference Books:

4. Vashishta B. R. A. K. Sinha. 2010. Botany for Degree student – Fungi. S. Chand & Co. New Delhi.
5. Pandey, S. N., Mishra. S.P and Trivedi P.S. 2009, A text book of Botany, Volume II , Vikas Publishing House Pvt. Ltd., Delhi.
6. Rao, K. N., Krishnamoorthy, K. V. and Rao, G. S. 1979. Ancillary Botany. S. Viswanathan Pvt., Madras.

Mapping

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

SEMESTER III

Programme Code	B. Sc.	Programme Title	Bachelor of Science	
Course Code	18U3BON01	Title	Batch	2018 -2021
Hours/Week	2	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 obtain knowledge on edible mushroom cultivation, types and nutrient content of edible mushrooms.
K2	CO2	Gaining knowledge on pure culture of mushroom cultivation.
K3	CO3	Familiarizing the technical aspects of mushroom cultivation.
K4	CO4	To analyze the marketing of mushroom products.

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*. 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.

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.

Text Books:

1. Pandey, B. P. Economic Botany. 2012. S. Chand and Company Limited, New Delhi. Fourth Edition.
2. Rashtra Vardhana. Economic Botany. 2009. Arup Book Publishers Private Limited, New Delhi, First Edition.
3. Verma, V. A. Textbook of Economic Botany. 1980. Emkay Publications, New Delhi, Third Edition.
4. Maheshwari, P. and U. Singh. 1965. Dictionary of Economic plants in India. ICAR, New Delhi.

Reference Books:

1. Hill, A. F. Economic Botany. 1952. Textbook of useful plants and plant products. McGraw-Hill Book Company, New York, Second Edition.
2. Thompson, H. C. 1949. Vegetable Crops. McGraw-Hill Book Company, New York, Fourth Edition.
3. Wallis, T. E. 1946. Text book of pharmacognosy. J. and A. Churchill Limited, London.

Mapping

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

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U4BOC04	Title	Batch	2018 -2021
Hours/Week	5	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 obtain knowledge on simple and complex permanent tissues.
K2	CO2	Gaining knowledge on primary and secondary growth of monocot and dicot stem and root.
K3	CO3	Familiarizing the technical aspects of seed science.
K4	CO4	To analyze the reproductive structures of an angiospermic plant.

Unit - I **(12 Hours)**

Anatomy - Introduction. 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*) and monocot. Polyembryony. Apomixis.

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 Books:

1. Pandey, B. P. 2014. Plant Anatomy, S. Chand and Company, New Delhi.
2. Vashishta, P. C. 2000. A Text Book of Plant Anatomy. S. Chand and Company, New Delhi.
3. Bhojwani, S. S. and Bhatnagar, S. P. 2009. The Embryology of Angiosperms, Vikas Publishing House Private Limited, New Delhi.
4. Dwivedi, J. N. 1988. Embryology of Angiosperms. Rastogi and Company, Meerut.
5. Rattan Lal Agarwal. 2004. Seed Technology. Oxford and IBH Publishing Company Private Limited, New Delhi.

Reference Books:

1. Fahn, A. 1982. Plant Anatomy (3rd Edition). Pergoman Press, Oxford.
2. Esau, K. 1960. Plant Anatomy, Wiley Eastern Private Limited, New Delhi.
3. Maheswari, P. 1971. An Introduction to the Embryology of Angiosperms. Tata McGraw Hill Publishing Company Limited, New Delhi.

Mapping

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

Core Practical

For Students Admitted from the academic year 2018 – 2019

Anatomy, Embryology and Seed Science-18U4BOCP02

Anatomy:

1. Study of Ergastic substances (Cystolith, Raphides, Sphaeroraphides&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* (Permanent slides)
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 2017 – 2017

Core Major Practical II (For Core Course IV &VI)

(Mushroom Cultivation Technology, Anatomy, Embryology and Seed Science

17U4BOCP02

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 – 2, Slide – 2, Reasons – 2and Diagram – 2)

2. Make suitable mushroom bed preparation of **D**. Leave the bed for valuation. **(10×1=10)**

3. Dissect and mount any one of the stages of the given material **E.** (Diagrams and notes not necessary) **(6×1=6**)

4. Name the genus and morphology of given part of **F** and **G.** **(2×2=4)**

(Genus – 1 and Morphology – 1)

5. Write notes on **H, I** and **J.** **(2×3=6)**

Key:

A and B	- Anatomy of Angiosperms – vegetative part
C	- Mushroom – microscopic examination
D	- Mushroom Cultivation—Preparation of Beds
E	- Embryo – Dicot - *Tridax*
F and G	- Macroscopic - Types of mushrooms
H, I and J	- Permanent slides (Anatomy, Embryology and Seed science)

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U4BOS02A	Title	Batch	2018 -2021
Hours/Week	2	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 obtain knowledge on classification and nomenclature of microbes.
K2	CO2	Gaining knowledge on sterilization techniques.
K3	CO3	Familiarizing the industrial uses of microbes.
K4	CO4	To analyze the plant diseases caused by microbes.

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, viruses, nematodes, insects, pests and rodents. 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.
2. Patel, A. H. 2005. Industrial Microbiology. Mac Milan India Limited, Chennai.
3. Pandey, B. P. 2008. A Text Book of Plant Pathology, S. Chand and Company Limited, New Delhi.
4. Sharma, P. D. 2006. Plant Pathology, Narosa Publishing House, New Delhi.
5. Pelzer, T. R., Chan, M. J., and Kreig, N. R. 1993. Microbiology. Mc Graw –Hill Inc, New York.
6. Prescott, L. M.., Harley, J. P. and Klein, D. A. 1993. Microbiology, 2nd Edition, WM. C. Brown Publishers, United States of America.

Reference Books:

1. Sundara Rajan, S. 2003. College Microbiology. Volume I and II Revised Edition, Vardhana Publication, Bangalore.
2. Robert, I. Tate. 1995. Soil Microbiology, First Edition, John Wiley and Sons Inc., New York.
3. Hugo, W. B. and Russell, A. D. 1998. Pharmaceutical Microbiology, Sixth Edition, Black Well Scientific Company Limited, United Kingdom.
4. Rangasami, G. 1994. Diseases of Crop Plants in India, Printice Hall of India Limited, Delhi.

Mapping

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

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U4BOS02B	Title	Batch	2018 -2021
Hours/Week	02	Biopesticides	Semester	III
			Credits	02

Course Objective

- To study the preparation and applications of biopesticides.

Course Outcomes (CO)

K1	CO1	To remember the botanicals and biopesticides.
K2	CO2	To understand the various biopesticides preparations and their bioefficacy.
K3	CO3	To apply the biopesticides production technology in pest control.
K4	CO4	To evaluate the uses of biopesticides.

Unit – I **7 Hours**

Botanicals and biopesticides – Introduction and potential pesticidal plants of India. Plant extraction and organisms - use and potential. Role of neem in plant protection-constituents.

Unit – II **7 Hours**

Bioefficacy of various preparations. Azadirachtin and its role in pest control. Chemistry of Pyrethrins and Pyrethroids, Rotenone, Nicotine and Nicotinoids.

Unit – III **7 Hours**

Biological pest control- use of predators (lady bird beetle, crysopa) and parasites (*Trichogramma*) in insect control, pathogens in disease and insect control (*Bacillus thuringiensis*, NPV). Pheromones and attractants – Introduction, types and application.

Unit – IV **7 Hours**

Insect Growth Regulators – definition, types, mode of action and role in pest management natural and synthetic Juvenile hormones, Chitin synthesis inhibitors – Novaluron, Buprofezin Moulting Hormone Agonists – Halofenozide, Tebufenozide Moulting Hormones – A- Ecdysone, Ecdysterone Moulting Inhibitors - Diofenolan Precocenes – I, II, III.

Unit – V **7 Hours**

Biotechnology in pest management - brief introduction, BT methodology, genetically modified and transgenic plants.

Text Books:

1. Botanicals and Biopesticides - Ed. B. S. Parmar and C. Devakumar, New Delhi Westvill Publishing House, 1993.

2. Pesticides – Ed. G.S. Dhaliwal and B. singh.

3. Green Trends in Insect Control, Ed. Oscar Lopez & Jose G. Fernandez-Bolanos, Royal Soc of Chemistry (2011)

4. Biological Insect Pest Suppression - H.C. Coppel and J.W. Mertins (Springer Verlag) ISBN-3-540-07931-9, 1977.

5. Biological Pest Control- The glasshouse experience - N.W. Hussey and N. Scopes, ISBN- 0-7137- 1439-5, 1985.

6. Safer Insecticides Development and Use, E. Hodgson and R.J. Kuher (Dekker) North Carolina State Raleigh University, North Carolina, 1990.

7. Insects Sex Pheromones- M. Jacobson United Kingdom edition published by Academic Press Inc New York, 1972.

Mapping

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

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Chemistry)	
Course Code	18U4BOA02	Title	Batch	2018 -2021
Hours/Week	5	Allied Botany - II	Semester	IV
			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.

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**.**

Unit - II **(12 Hours)**

Taxonomy:

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

Unit - III **(12 Hours)**

Cytology and Genetics:

Cytology: Structure of plant cell and brief outline of the following cell organelles: Endoplasmic Reticulum, 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.

Unit -V **(12 Hours)**

Embryology:

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

Text Books:

1) Pandey, B. P. 2011. Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany. S. Chand and Company Private Limited, New Delhi.
2) Pandey, B. P. 2001. Plant anatomy. S. Chand and Company Private Limited, New Delhi.
3) Sumitra Sen and Dipak Kumar Kar. 2006. Cytology and Genetics. Narosa Publishing House Private Limited, New Delhi.
4) Sundararajan, S. 2000. Cytogenetics. Anmol Publications Private Limited, New Delhi.
5) Verma, P. S. and Agarwal, V. K. 2008. Cytology. 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) Sambamurthy, A. V. S. S. 1999. Genetics. Narosa Publishing House, New Delhi.

Mapping

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

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

For Students Admitted from the academic year 2018 – 2098

Second Allied Practical - I (18U4BOAP01)

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.

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 and monocot root and stem.

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 2018 – 2019

Second Allied Practical I (18U4BOAP01)

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 – 1 and Reasons -4)

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.** **(5×2=10)**

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

4. Write critical notes on **J, K, L** and **M.** **(3×4=12)**

(Identification -1 and Notes – 2)

5. Comment on the setup **N** **(3×1=3)**

Key:

Family Identification:

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

Spotters – Economic Importance:

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

Section:

H – Anatomy

I – Gymnosperms

Spotters – Permanent slides:

J – Algae or Fungi

K – Bryophytes or Pteridophytes

L – Cytology or Genetics

M – Embryology or Plant Ecology

Physiology experimental setup:

N – Physiology Experiment.

SEMESTER IV

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U4BON02	Title	Batch	2018 -2021
Hours/Week	2	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 obtain knowledge on various Indian systems of medicines.
K2	CO2	Gaining knowledge on tribes and native medicines.
K3	CO3	Familiarizing 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.

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, CNS depressants and Hallucinogenics). Drugs used in disorders of gastrointestinal tract (Carminatives, Bulk laxatives and Purgatives) and cardio vascular drugs (Cardiotonics, Cardiac depressants and Antihypertensives).

Text Books:

1. Jain, S. K. 1987. A Manual of Ethnobotany. Scientific Publishers, Jodhpur.
2. Bhattacharjee, S. K. 1988. Hand Book of Medicinal Plants. Pointer Publishers, Jaipur.
3. Wallis, T. E., 1997. Text Book of Pharmacognosy. C.B.S Publishers, Bangalore.
4. Purohit and Vyas, 2004. Medicinal Plants Cultivation, Agrobios Publication, 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. Agarwal, 1985. Drug Plants in India. Kalyani Publishers, Ludhiana.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOC05	Title	Batch	2018 -2021
Hours/Week	05	Morphology and Taxonomy of Angiosperms	Semester	V
			Credits	05

Course Objective

- To study the morphology, selected families and their economic importance of angiosperms.

Course Outcomes (CO)

K1	CO1	To remember the general characters and classification of angiosperms.
K2	CO2	Gaining knowledge on technical terms related to flower.
K3	CO3	Familiarizing the various system of classification.
K4	CO4	To analyze the vegetative and reproductive characters of selected families.

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, Nymphaeaceae, 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, Verbinaceae, Amarantaceae and Poaceae.

Text Books:

1. Gangulee, H. C., Das, K. S. and Datta, C. T. 1964. – College Botany – Volume I, Basant Panchami, Calcultta.
2. Pandey, S.N. and Misra, S. P. 2008. Taxonomy of Angiosperms. Ane Books Private Limited, New Delhi.
3. Pandey, P. B. 1989. Taxonomy of Angiosperms (Systematic Botany), S. Chand and Co. Ltd., New Delhi.
4. Pandey, B. P. 2000. Economic Botany, S. Chand and Co., New Delhi.
5. Singh. V. and Jain, D. K. 2004. Taxonomy of Angiosperms. Rastogi Publications, Meerut.
6. Sambamurty, A.V.S.S. 2005. Taxonomy of Angiosperms. I.K. International Pvt. Ltd., New Delhi
7. Vashista, P. C. 1997. Taxonomy of Angiosperms. S. Chand and Co., New Delhi.

Reference Books:

1. Lawrence, G. H. M. 1953. Taxonomy of Vascular Plants, Oxford and IBH Publishes, New Delhi.
2. Mathews, K. M. 1987 – 90. Flora of Tamil Nadu and Carnatic (1 – 4 Vols.) Rapinat Herbarium, Trichy.
3. Narayanaswamy, R. V and Rao, K. N. 1976. Outlines of Botany, S. Viswanthan Printers and Publishers, Madras.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOC06	Title	Batch	2018 -2021
Hours/Week	05	Cell Biology and Genetics	Semester	V
			Credits	05

Course Objective

- To study the structural and functional characters of cell and its organelles

Course Outcomes (CO)

K1	CO1	To remember the basics of cell and its components..
K2	CO2	To understand the basic concepts of Mendelian genetics, its variations and its applications.
K3	CO3	Familiarizing the DNA structure, types and replication.
K4	CO4	To analyze the complete and incomplete linkage.

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 (Friut colour in *Cucurbita*), Recessive Epistasis (Petiole length in Tobacco) Multiple factors (Colour of wheat kernel) and Multiple alleles (Self sterility in *Nicotiana*, Blood groups in man).

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 - Weinburg principle, significance and its application. Factors affecting gene frequencies, Gene pool, Genetic drift and frequency.

TEXT BOOKS:

1. David Freifelder. (1987). Molecular Biology. N. K. Narosa Publishing House, New Delhi.
2. Monroe W. Stickberger. (1985). Genetics. Rekha Printers Private Ltd., New Delhi.
3. Sambamurty, A. V. S. S. (2008). Molecular Biology. Narosa Publishing House Pvt. Ltd, Chennai.
4. Verma, P. S. and Agarwal, V. K. (2009). Genetics. S. Chand & Company Ltd., New Delhi.

REFERENCE BOOKS:

1. Robert H. Tamarin. (2002). Principles of Genetics. Tata Mcgraw – Hill Publishing Company Ltd., New Delhi.
2. Sumitra Sen, Dipak Kumar Kar, (2006). Cytology and Genetics. Narosa Publishing House Pvt. Ltd, New Delhi.
3. Sundararajan, S. (2000). Cytogenetics. Anmol Publications Pvt. Ltd., New Delhi.
4. Verma, P. S. & Agarwal, V. K. (2008). Cytology. Chand & Company Ltd., New Delhi.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOC07	Title	Batch	2018 -2021
Hours/Week	04	Plant Ecology, Phytogeography and Conservation Biology	Semester	V
			Credits	04

Course Objective

- To study the concept, components, types of ecosystem, food chain and food web.

Course Outcomes (CO)

K1	CO1	To bridge the basic concepts of ecosystem and its living forms.
K2	CO2	To acquire knowledge on vegetation, plant adaptation and environmental pollution. To understand the basic concepts of Mendelian genetics, its variations and its applications.
K3	CO3	To create awareness on conservation strategies and the importance of environment education.
K4	CO4	To analyze the insitu and exsitu 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, Peridiocity 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 **(11 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 BOOKS

1. Sharma, P.D. (2009).Ecology and Environmental, Rastogi Publishers, Meerut.
2. Shukla, R.S. Chande, I.P.S. (2012). Plant Ecology and Soil Science., S. Chand & Co., Chennai.
3. Vasishta, P. C, (1979), Plant Ecology, Vishal Publication. Kolkatta.
4. Verma V.A. (1981), A Text book of plant Ecology, Emkay publication, New Delhi.
5. Sharma, J.P. (2004). Environmental studies, Lakshmi Publications (P) Ltd, New Delhi
6. Kumaresan, V. Arumugam, N. 2015. Plant Ecology & Phytogeography, Saras Publication, Nagercoil.
7. Krishnamurthy, K. V. (2006). An Advanced Textbook on Biodiversity: Principles and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

REFERENCES BOOKS

1. Edward J. Kormondy, (1996). Concept of Ecology, Prentice Hill of India Pvt, Ltd. New Delhi.
2. George L. Clarke (1954). Elements of Ecology. John Wiley & sons. Inc., New York.
3. Odum E.P. (1971). Fundamentals of ecology, W.B. Saunders Co., Phiadephia, London.
4. K.N.Bhatia (2005) A Treatise on Plant Ecology, Pradeep Publications , Jalandhar.
5. Robert Smith, (1977). Elements of ecology and field biology, Harper and Raw Publishers, New York, London.
6. Misra, R. (1986). Ecology work book, Oxford and IBH publishing company, New Delhi.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOE01A	Title	Batch	2018 -2021
Hours/Week	04	Plant Breeding and Evolution	Semester	V
			Credits	04

Course Objective

- To study the plant breeding techniques and evolution.

Course Outcomes (CO)

K1	CO1	To learn the selection and methods of plant breeding.
K2	CO2	To acquire knowledge on various hybridization techniques.
K3	CO3	To understand the breeding and theories of evolution.
K4	CO4	To apply the breeding techniques for crop improvement.

Unit - I **(12 Hours)**

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

Unit - II **(12 Hours)**

Hybridization techniques - interspectific and intergeneric hybridization - heterosis. Hybrid vigour and utilization. Mutation in breeding- Spontaneous Mutations, Mutagens and Induced Mutations. Heterosis, Autoploidy, Polyploids in plant breeding. Genetic erosion: reasons 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 varieties.

Unit - IV **(12 Hours)**

Breeding for crop improvement with reference to Paddy, Wheat, Sugarcane and Ground nut.

Unit - V **(12 Hours)**

Evolution -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 Books:

1. Allard, R.W (1960). Principles of Plant Breeding. John Wiley & Sons, New York.
2. Chaudhari, H.K. 1984. Elementary Principles of Plant Breeding. Oxford & IBH publishing Co. Pvt. Ltd., 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 & Co., New Delhi.
5. Verma, P. S. and Agarwal, V. K. (1998). Concepts of Evolution. S. Chand & Co, New Delhi.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOE01B	Title	Batch	2018 -2021
Hours/Week	04	Intellectual Property Rights	Semester	V
			Credits	04

Course Objective

- To study the IPR, copyrights and patent.

Course Outcomes (CO)

K1	CO1	To learn the fundamentals of IPR.
K2	CO2	To acquire knowledge on various copyright procedures.
K3	CO3	To understand the patent.
K4	CO4	To apply the patent and copyrights.

Credits: 3
Total hrs.: 60

Objective:

- To study importance of Intellectual Property Rights, Patent and Copyrights.

Learning Outcomes:

- Acquiring knowledge on protection of plant varieties, patent and copy rights.

Unit–I **(12 Hours)**

IPR in India and world: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO). Patents - Objectives, Rights, Patent Act 1970 and its amendments. Procedure of obtaining patents, working of patents.

Unit–II **(12 Hours)**

Copyrights -Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement. Trademarks -Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defences, Domain name.

Unit–III **(12 Hours)**

Geographical indications -Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position. Protection of traditional knowledge - Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

Unit–IV **(12 Hours)**

Protection of Plant Varieties Plant Varieties Protection-Objectives, Justification, International Position, Plant varieties protection in India. Rights of farmers, Breeders and Researchers. National gene bank, Benefit sharing. Protection of Plant Varieties and Farmers' Rights Act, 2001.

Unit–V **(12 Hours)**

Computer Software and Intellectual Property, Database and Data Protection, Protection ofSemi-conductor chips, Domain Name Protection.

Text Books:

1. Manjula Guru and Rao, M. B. 2003. Understanding Trips – Managing Knowledge in Developing Countries, Sage Publications.
2. Ganguli. 2001. Intellectual Property Rights: Unleashing the Knowledge Economy, TataMcGraw-Hill.
3. Arthur Raphael Miller, Michael H. Davis. 2000. Intellectual Property: Patents, Trademarksand Copyright in a Nutshell, West Group Publishers.
4. Jayashree Watal, Intellectual property rights in the WTO and developing countries, Oxford University Press, Oxford.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOS03A	Title	Batch	2018 -2021
Hours/Week	02	Horticulture and Nursery Management	Semester	V
			Credits	02

Course Objective

- To study the methods and gardening of horticultural crops

Course Outcomes (CO)

K1	CO1	To learn the basics and propagation methods of horticultural crops.
K2	CO2	To acquire knowledge on concepts of garden designing.
K3	CO3	To understand the importance of horticulture in human welfare.
K4	CO4	Applying the nursery management techniques for the cultivation of various plants.

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 Books:

1. Adams, C.R. and Early, M.P. (2004). Principles of Horticulture. Elsevier, New Delhi.
2. Barton West, R. (1999). Practical Gardening in India. Discovery Publishing House, New Delhi.
3. Chadha, K.L. (2001). Hand Book of Horticulture, ICAR Publications, New Delhi.
4. George Acquaah. (2009). Horticulture Principles and Practices. PHI Learning Private Limited, New Delhi.
5. Kumar, N. (2014). Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.
6. Mazundar, B.C. and Mukhopadhyay, P.M. (2006). Principles & Practices of Herbal Garden. Daya Publishing House, New Delhi.
7. Percy Lancasher. (2004). Gardening in India. Oxford IBH Publishing Company Private Limited, New Delhi.
8. Sadhu, M.K. (1996). Plant Propagation. New Age International Publishers, New Delhi.
9. Sheela, V. L. (2011). Horticulture. MJP Publishers, Chennai.

Mapping

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

SEMESTER - V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOS03B	Title	Batch	2018 -2021
Hours/Week	02	Stress Biology	Semester	V
			Credits	02

Course Objective

- To study the plant stress and adaptations.

Course Outcomes (CO)

K1	CO1	To remember the types of plant stress.
K2	CO2	To understand the hypersensitive and Pathogenesis related proteins.
K3	CO3	To study the plants sensing mechanism.
K4	CO4	To evaluate the biotechnological approaches for tolerance in plants.

Unit – I **7 Hours**

Plant stress definition and type of stresses, plant responses and mechanisms of tolerance of biotic and abiotic stresses. Environmental factors, Water stress, Salinity stress, High light stress and Temperature stress.

Unit – II **7 Hours**

Hypersensitive reaction and Pathogenesis– related (PR) proteins. Systemic acquired resistance; Mediation of insect and disease resistance by jasmonates.

Unit – III **7 Hours**

Stress sensing mechanisms in plants. Role of nitric oxide. Calcium modulation, Phospholipid signaling. Developmental and physiological mechanisms that protect plants against environmental stress.

Unit – IV **8 Hours**

Adaptation in plants; Changes in root: shoot ratio; Aerenchyma development; osmotic adjustment; Compatible solute production. Reactive oxygen species. Production and scavenging mechanisms.

Unit – V **7 Hours**

Biotechnological approaches for tolerance in plants. Molecular Biology of stress tolerance, Genetic Engineering in stress tolerance.

Text Books:

1. Noggle, GR. and Fritz, GJ. 1976. Introductory Plant Physiology, Prentice - Hall, India.

2. Verma, S. K., Mohit Verma. 2008. A Textbook of Plant Physiology, Biochemistry and Biotechnology, S. Chand and Company Private Limited, New Delhi.
3. Pandey, S.N and Sinha, B .K (2001). Plant Physiology. Third revised Edition, Vikas Publishing House Private Limited, New Delhi.
4. Jain, V. K. 2007. Fundamentals of Plant Physiology, S. Chand and Company Limited, New Delhi.

Mapping

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

SEMESTER V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOS04A	Title	Batch	2018 -2021
Hours/Week	02	Forest Botany	Semester	V
			Credits	02

Course Objective

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

Course Outcomes (CO)

K1	CO1	To remember the monoculture and polyculture.
K2	CO2	To learn the cultivation methods following in the development of forest.
K3	CO3	To understand the importance of trees for living beings.
K4	CO4	To participate in the conservation of forest.

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 Books:

1. Chundawat, B.S. and Gautham, S.K. 1996. Text book of Agroforestry. Oxford and IBH publisher, New Delhi.
2. Dhiman, A.K. 2003. Sacred plants and their medicinal uses. Daya publishing house, New Delhi.
3. Kollmann, F.F.P. and Cote, W.A. 1988. Wood science and Technology. Vol. I & II Springer Verlag, New York.
4. Mehta, T. 1981. A handbook of forest utilization. Periodical Expert Book Agency, New Delhi.
5. Rao, K.R. and Juneja, J.D. 1971. A handbook for field identification of fifty important timbers of India. The Manager of Publications, Govt. of India, New Delhi.
6. Sagreiya, K.P. 1994. Forests and Forestry (Revised by S.S. Negi). National Book Trust. New Delhi.
7. Sharma, P.D. 2004. Ecology and Environment. Rastogi Publications, Meerut.
8. Singh, M.P. and Vishwakarma, V. 1997. Forest environment and Biodiversity. Daya Publishing House, New Delhi
9. Tiwari, K.M. 1983. Social forestry in India. Nataraj Publishers, Dehra Dun.
10. WF. 2007. Timber identification manual. TRAFFIC, New Delhi.

Mapping

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

SEMESTER - V

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U5BOS04B	Title	Batch	2018 -2021
Hours/Week	02	Floriculture	Semester	V
			Credits	02

Course Objective

- To study the scope and importance of floriculture.

Course Outcomes (CO)

K1	CO1	To remember the role of plant growth regulators.
K2	CO2	To learn the cultivation of ornamental plants.
K3	CO3	To understand the importance floriculture.
K4	CO4	To evaluate the diseases and pests in ornamental plants.

Unit – I **7 Hours)**

Introduction: History of gardening; Importance and scope of floriculture and landscape gardening. Landscaping Places of Public Importance: Landscaping highways and Educationalinstitutions.

Unit – II **(7 Hours)**

Nursery Management and Routine Garden Operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators.

Unit – III **(7 Hours)**

Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai. Diseases and Pests of Ornamental Plants.

Unit – IV **(7 Hours)**

Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden. Some Famous gardens of India.

Unit – V **(7 Hours)**

Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold,Rose, Lilium, Orchids).

Text Books:

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.
2. Barton West, R. (1999). Practical Gardening in India. Discovery Publishing House, New Delhi.
3. *Chadha*, K.L. (2001). Hand Book of Horticulture, ICAR Publications, New Delhi.
4. *George Acquaah. (*2009). Horticulture Principles and Practices. PHI Learning Private Limited, New Delhi.
5. Kumar, N. (2014). Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.

Mapping

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

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U6BOC08	Title	Batch	2018 -2021
Hours/Week	06	Plant Physiology and Biochemistry	Semester	VI
			Credits	05

Course Objective

- To study an overall perception about various physiological processes occurring in plants.

Course Outcomes (CO)

K1	CO1	To remember the role of essential nutrients in plant metabolism and their deficiency symptoms and control measures.
K2	CO2	To understand the photosynthesis in higher plants.
K3	CO3	To apply the role of plant growth hormones.
K4	CO4	To analyze 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 Books:

1. Devlin, R.M. (1969). Plant Physiology. Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi.
2. Jain, J.L. (1998): Fundamentals of Biochemistry. S. Chand & Co., New Delhi.
3. Jain, V.K. (1990). Fundamentals of Plant Physiology. S. Chand & Co., New Delhi.
4. Pandey, S.N. (1991). Plant Physiology. Vikas Publishing House (P) Ltd., New Delhi.
5. Sinha, R. K. (2007). Modern Plant Physiology. 2nd Edition, Tata McGraw Hill Publishing Co Ltd., New Delhi.
6. Verma, S.K. (1999). Plant Physiology & Biochemistry. S. Chand & Co., New Delhi.
7. 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. (Eds.,) (2000). Plant Biochemistrty. Harcourt Asia (P) Ltd., India & 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.

Mapping

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

PRACTICALS

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 IV (For Core Course IX &XI)
(Plant Ecology, Phyto-geography, Conservation Biology, Plant Physiology and Biochemistry) – 18U6BOCP04

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. (15)
2. Construct a simple quadrat **B.** Study the plant community and analyse the vegetation. (7)
3. Based on morphological and anatomical characters, assign **C** and **D** to their respective probable habitats. Draw suitable diagrams. Submit slides for valuation. (12)
4. Draw and comment on the set up **E.** (4)
5. Write a comment on **F**, **G**, **H** and **I**. (12)

Key:

A	- Plant physiology individual experiments
B	- Plant Ecology
C & D	- Plant Ecology
E	- Plant physiology demonstration
F, G, H & I	- Plant physiology/ Biochemistry/ Plant Ecology/ Phyto-geographical regions/Conservation Biology

Semester VI

Core course XII - Mini - Group - Project Work – 18U6BOPR01

5 Credits /6hrs/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 he/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 HOD.
- 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 his/her original research.
- Minimum of 3 yrs 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 (Zoology)	
Course Code	18U6BOE02A	Title	Batch	2018 -2021
Hours/Week	04	Ethnobotany, Medicinal Plants and their Utilization	Semester	VI
			Credits	04

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 methods to study ethnobotany.
K2	CO2	To understand the Indian systems of medicine.
K3	CO3	To apply the breeding methods of medicinal plants.
K4	CO4	To analyze the macroscopic and microscopic characters of selected medicinal plants.

Unit - I **(12 Hours)**

Ethnobotany: Definition; Ethnobotany in India, Ethnic communities of India and Tamil Nadu. 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).

Unit - III **(12 Hours)**

Breeding 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 (*Rauwolfia*), drugs from bark (*Cinchona*), drugs from stem of wood (*Ephedra*), drugs from underground stem (*Zingiber*), drugs from leaf (*Aloe*), drugs from flower (*Eugenia*), drugs from fruit (*Feronia*) 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 Books:

1. Arumugam, K. R. and Murugesh, N. 2003. Text Book of Pharmacognosy. Sathya Publishers, Madurai.
2. Gokhale, S. B., Kokate, C. K. and Purohit, A. P. 2010. Pharmacognosy, Nirali Prakashan, Pune.
3. Jain. 2001. Medicinal Plants. National Book Trust, New Delhi.
4. Purohit and Vyas. 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd Edition, Agrobios Publication, Jodhpur.
5. Ravindra Sharma. 2003. Medicinal Plants of India (An Encyclopedia), Daya Publishing House, New Delhi.
6. Trivedi, P. C. 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios Publication, Jodhpur.

Reference Books:

1. Bhattacharya, A. K. and Hansda, R. 2003. Hand book of Medicinal Plants. Pointer Publishers, Jaipur.
2. Handa, S. S. and Kapoor, V. K. 1998. Pharmacognosy. Vallabh Prakashan, New Delhi.
3. Wallis, T. E. 1997. Text book of Pharmacognosy. C.B.S. Publishers and Distributors, New Delhi.

Mapping

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

SEMESTER – VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U6BOE02B	Title	Batch	2018 -2021
Hours/Week	04	Biostatistics	Semester	VI
			Credits	03

Course Objective

- Students will be able to make informed decisions based on data and apply statistical tools and techniques in their research works

Course Outcomes (CO)

K1	CO1	Solve problems quantitatively using appropriate arithmetical, algebraic, orstatistical methods.
K2	CO2	Create and interpret visual representations of quantitative information, such asgraphs or charts.
K3	CO3	Understand and critically assess data collection and its presentation.
K4	CO4	Understand why biologists need a background in statistics.

Unit – I **12 Hours**

Introduction to Bio-Statistics - Development of Biostatistics and its applications - Sources of biological data - Secondary and Primary sources - Classification and tabulation of data - frequency distribution -Diagrammatic and Graphical representation of statistical data.

Unit – II **12 Hours**

Sampling and Theoretical Distributions - Sampling – meaning, advantages, concept of parameter and statistics, sample size, sampling error, sampling frame, Types of samples – Probability and non-Probability samples – purposive sampling, Reliability of samples. Introduction of probability and its applications – Theoretical Distributions – Binomial, Poisson and Normal distributions; Properties, uses and applications.

Unit – III **12 Hours**

Descriptive Statistics - Measures of central tendency - Measures of Dispersion: Measures – Mean, Median, Mode Range, and standard deviation, absolute and relative measures ofdispersion.

Unit – IV **12 Hours**

Correlation and Regression Analysis - Theory of correlation and regression. Definition, uses, types and correlation, Regression Lines – Properties of regression coefficients.

Unit – V **12 Hours**

Biological Measures and Hypothesis Testing: Rates, incidence, prevalence, mortality rate, case fatality; Measurement of risk, odds ratio and Bio-assay and dose responses. Test of attributes, small and large sample tests - Analysis of variance – one-way and two-way classification.

Text Books:

1. Arora P.N. Malhan P.K. 1996. Biostatistics, Delhi : Himalaya Publishing House.
2. Gupta, S.P.1992. Statistical Methods, New Delhi: Sultan Chand, 1992.
3. Gupta C.B.1992. An Introduction to statistical methods Vikas Publishers, New Delhi;
4. Daroga Singh, Chaundjari F.S.1986. Theory and Analysis of Sample survey, New Delhi; Wiley Eastern Ltd. New Delhi.
5. Palanichamy S. and Manoharan M. Statistical methods for biologists, Palni Paramount Pub. Palni

Mapping

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

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U6BOE03A	Title	Batch	2018 -2021
Hours/Week	04	Plant Biotechnology, Microscopy and Microtechnique	Semester	VI
			Credits	04

Course Objective:

- To study the fundamentals and applications of plant biotechnological methods.

Course Outcomes (CO)

K1	CO1	To remember the basic principles of plant tissue culture.
K2	CO2	To understand the application of plant tissue culture in agriculture and forestry.
K3	CO3	To apply the principles and techniques of genetic engineering.
K4	CO4	To analyze the various principles of light microscopy.

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 Books:

1. Dubey, R. C. (2001). A Text Book of Biotechnology. S. Chand & Co. Ltd, New Delhi.

2. Ignacimuthu, S. (1996). Basic Biotechnology. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

3. Kumaresan, V. (2001). Biotechnology, Saras Publications, Nagercoil.

4. Ashok Kumar. (2006). Plant Biotechnology. Discovery Publishing House, New Delhi.

5. Chukla, H. S. (2004). Introduction to Plant Biotechnology. Oxford and IBH Publishing Co

6. Jeyanto Achrekar. (2005). Concepts in Biotechnology. Dominant Publisher and Distributors,

7. Marimuthu, R. (2008). Microscopy and Microtechnique. MJP Publishers, Chennai.

Ltd., New Delhi.

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. Sathyanarayanan, U. (2005). Biotechnology. Books and Allied (P) Ltd., Kolkata.

Mapping

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

SEMESTER - VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U6BOE02B	Title	Batch	2018 -2021
Hours/Week	04	Biostatistics	Semester	VI
			Credits	03

Course Objective

- Students will be able to make informed decisions based on data and apply statistical tools and techniques in their research works

Course Outcomes (CO)

K1	CO1	Solve problems quantitatively using appropriate arithmetical, algebraic, orstatistical methods.
K2	CO2	Create and interpret visual representations of quantitative information, such asgraphs or charts.
K3	CO3	Understand and critically assess data collection and its presentation.
K4	CO4	Understand why biologists need a background in statistics.

Unit – I **12 Hours**

Introduction to Bio-Statistics - Development of Biostatistics and its applications - Sources of biological data - Secondary and Primary sources - Classification and tabulation of data - frequency distribution -Diagrammatic and Graphical representation ofstatistical data.

Unit – II **12 Hours**

Sampling and Theoretical Distributions - Sampling – meaning, advantages, concept of parameter and statistics, sample size, sampling error, sampling frame, Types of samples – Probability and non-Probability samples – purposive sampling, Reliability of samples. Introduction of probability and its applications – Theoretical Distributions – Binomial, Poisson and Normal distributions; Properties, uses and applications.

Unit – III **12 Hours**

Descriptive Statistics - Measures of central tendency - Measures of Dispersion: Measures – Mean, Median, Mode Range, and standard deviation, absolute and relative measures ofdispersion.

Unit – IV **12 Hours**

Correlation and Regression Analysis - Theory of correlation and regression. Definition, uses, types and correlation, Regression Lines – Properties of regression coefficients.

Unit – V **12 Hours**

Biological Measures and Hypothesis Testing: Rates, incidence, prevalence, mortality rate, case fatality; Measurement of risk, odds ratio and Bio-assay and dose responses. Test of attributes, small and large sample tests - Analysis of variance – one-way and two-way classification.

Text Books:

1. Arora P.N. Malhan P.K. 1996. Biostatistics, Delhi : Himalaya Publishing House.
2. Gupta, S.P.1992. Statistical Methods, New Delhi: Sultan Chand, 1992.
3. Gupta C.B.1992. An Introduction to statistical methods Vikas Publishers, NewDelhi;
4. Daroga Singh, Chaundjari F.S.1986. Theory and Analysis of Sample survey,New Delhi; Wiley Eastern Ltd. New Delhi.
5. Palanichamy S. and Manoharan M. Statistical methods for biologists, Palni Paramount Pub. Palni

Mapping

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

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U6BOS05A	Title	Batch	2018 -2021
Hours/Week	03	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 plant nutrient management and biofertilizer.
K2	CO2	To understand the importance and production of Cyanobacterial biofertilizers.
K3	CO3	To apply the role of phosphate solublizing microorganisms in crop productivity.
K4	CO4	To analyze the significance of vermicompost.

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 vermin compost.

Text Books:

1. Ananthakrishnan, T. N. (1992). Emerging Trends in Biological Control of Phytophagous, Insects. Oxford & IBH Publishing Co Ltd., New Delhi.
2. Lampkin, N. (1990). Organic Farming. Press Books, *Ipswich*, UK.
3. Palaniappan, S. P. and Anandurai, K. (1999). Organic Farming – Theory and Practice. Scientific Publishers, Jodhpur.
4. Rao, B.V.V. (1995). Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective. Parisaraprajna Parishtana, Bangalore.
5. Reddy M.V. (1995). Soil Organisms and Litter Decomposition in the Tropics. Oxford & IBH Publishing Co Ltd., New Delhi.
6. Sharma, A. (2002). Hand Book of Organic Farming. Agrobios, Jodhpur.
7. Singh, S. P. (1994). Technology for Production of Natural Enemies. PDBC, Bangalore.
8. Subba Rao, N.S. (2002). Soil Microbiology. Oxford & IBH Publishing Co Ltd., New Delhi.
9. Woolmer PL & Swift MJ. 1994. The Biological Management of Tropical Soil Fertility. TSBF & Wiley.

Mapping

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

SEMESTER - VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U6BOS05B	Title	Batch	2018 -2021
Hours/Week	02	Plants and Human Welfare	Semester	VI
			Credits	02

Course Objective

- To study the various uses of plants in human welfare.

Course Outcomes (CO)

K1	CO1	To remember the uses of plants.
K2	CO2	To learn the sustainability of plant diversity.
K3	CO3	To understand the importance plants in human welfare.
K4	CO4	To apply technical aspects of maintaining plant biodiversity.

Unit – I **7 Hours**

Uses of plants with respect to human well being - Importance of forestry their utilization and commercial aspects, Avenue trees, Ornamental plants of India, Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.

Unit – II **7 Hours**

Plant diversity its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agro biodiversity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants.

Unit – III **7 Hours**

Botanical name, family, morphology of useful part and uses of Cereals - Paddy, wheat, maize; Millets - Sorghum, Ragi, rye; Legumes - Blackgram, pigeon pea, green gram; Nuts - Ground nut, cashew nut, almond.

Unit – IV **7 Hours**

Vegetables - Tomato, carrot, cabbage; Fruits - Apple, mango, date palm; Fibers - Cotton, jute. Botanical name, family, morphology of useful part and uses of Wood - Teak, rose wood; Essential oil - Sunflower oil, Groundnut oil, Sesame oil.

Unit – V **8 Hours**

Spices and condiments - Cinnamon, Pepper, Cardamom, Nut-meg, Clove, Turmeric, Chillies; Beverages - Coffee, Cocoa; Tannin - Myrobalan; Latex - Rubber; Dyes - Indigo, Henna; Gum - Gum arabic; Sugars - Sugarcane; Fumigatory and mastigatory – Tobacco, Areca nut.

Text Books:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
2. Verma, V. A. Textbook of Economic Botany. 1980. Emkay Publications, New Delhi, Third Edition.
3. Maheshwari, P. and U. Singh. 1965. Dictionary of Economic plants in India. ICAR, New Delhi.

Mapping

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

SEMESTER VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Zoology)	
Course Code	18U6BOS06A	Title	Batch	2018 -2021
Hours/Week	03	Herbal Home Remedies	Semester	VI
			Credits	03

Course Objective:

- To study the importance of herbal home remedies.

Course Outcomes (CO)

K1	CO1	To remember the role of the herbs in day-to-day life.
K2	CO2	To understand the herbal remedies and herbal first aid.
K3	CO3	To apply the herbal preparations and remedies of selected medicinal plants.
K4	CO4	To analyze the herbal medicine and food preparation methods.

UNIT – I **(7 Hours)**

History and role of the herbs in day-to-day life. Beneficial aspects of herbal plants as food - common greens, vegetables, fruit, seeds and edible oils (general account only).

UNIT – II **(7 Hours)**

Herbal remedies - herbal first aid, home remedies-for common cold, fever, headaches, migraines, digestive and respiratory disorders, ear, eyes, mouth and throat infections, Skin care using herbal products.

UNIT – III **(7 Hours)**

Herbal medicine preparation**:** Decoction, infusion, syrup, tincture and poultice. Food: herbal salad, chutney, soup and tea.

UNIT-IV **(7 Hours)**

Herbal preparation and remedies of *Solanum trilobatum, Centella asiatica, Cissus quadrangularis, Piper betel, Ocimum sanctum, Azadirachta indica, Curcuma longa, Zingiber officinalis* and *Lawsonia inermis.*

UNIT – V **(8 Hours)**

Herbal preparation and remedies of *Murraya paniculata, Aerva lanata, Tribulus terresteris, Lippia nudiflora, Aloe vera, Moringa oleifera, Vitex negundo, Allium sativum, Cardiospermum halicacabum* and *Solanum nigrum.*

Text Books:

1. Bentley, R. and Trimen, H. (2000). Medicinal Plants Volume –I – III. Asiatic Publishing House, Delhi.
2. Deshpande, D.J. (2006). A Hand Book of Medicinal Herbs. Agrobios, Jodhpur.
3. Edwin Jerald, E. & Sheeja Edwin Jerald. (1998). Text Book of Pharmacognosy and Phytochemistry, CBS Publishers & Distributors, New Delhi.
4. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2010). Pharmacognosy, Nirali Prakashan, Pune.
5. Prajapathi, N. D. (2013). A Hand Book of Medicinal Plants. Agrobios, Jodhpur.
6. Sairam, T. V. (1999). Home Remedies Volume – I – V. Penguin Books India, Gurgaon.

Mapping

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

SEMESTER -VI

Programme Code	B. Sc.	Programme Title	Bachelor of Science (Botany)	
Course Code	18U6BOS06B	Title	Batch	2018 -2021
Hours/Week	02	Plant Resources	Semester	VI
			Credits	02

Course Objective

- To study the various plant resources.

Course Outcomes (CO)

K1	CO1	To remember the origin of crop plants.
K2	CO2	To learn the sustainability of plant resources.
K3	CO3	To understand the importance plants.
K4	CO4	To apply technical aspects of maintaining plant resources.

Unit – I **7 Hours**

Centres of diversity of plants. Origin of crop plants. Domestication and introduction of crop plants. Concepts of sustainable development, cultivation and uses of cereals – paddy, wheat, finger millet and barley.

Unit – II **7 Hours**

Concepts of sustainable development, cultivation and uses of pulses –green gram, red gram, black gram and bengal gram. Concepts of sustainable development, cultivation and uses of fruits – apple, banana, mango and orange.

Unit – III **7 Hours**

Concepts of sustainable development, cultivation and uses of vegetables – tomato, brinjal, snake gourd and squash guard. Concepts of sustainable development, cultivation and uses of rose, jasmine and chrysanthemum.

Unit – IV **7 Hours**

A general account on plants yielding oil, spices and beverages. An account on fiber and medicinal plants.

Unit – V **7 Hours**

Conservation of plant resources in agriculture and forestry. In situ conservation – national parks, sanctuaries, biosphere reserves, mangroves and wetlands. Ex situ conservation – botanical gardens, gene banks, seed banks and cryobanks.

1. Verma, V. A. Textbook of Economic Botany. 1980. Emkay Publications, New Delhi, Third Edition.
2. Maheshwari, P. and U. Singh. 1965. Dictionary of Economic plants in India. ICAR, New Delhi.
3. *Chadha*, K.L. (2001). Hand Book of Horticulture, ICAR Publications, New Delhi.
4. *George Acquaah. (*2009). Horticulture Principles and Practices. PHI Learning Private Limited, New Delhi.
5. Kumar, N. (2014). Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.

Mapping

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