

DEPARTMENT OF BOTANY
NALLAMUTHU GOUNDER MAHALINGAM COLLEGE
(AUTONOMOUS)
POLLACHI – 642 001

SYLLABUS
CBCS & OUTCOME BASED EDUCATION
For the students admitted during 2019 - 2022

B.Sc., BOTANY
&
ALLIED ZOOLOGY

REVISED ON THE BOARD OF STUDIES
HELD ON FEBRUARY 2019

NGM COLLEGE

Vision

Our dream is to make the college an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society

Mission

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instil research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

DEPARTMENT OF BOTANY

Vision

The Department of Botany aims to achieve high quality education and research relevant to local, regional and national needs and through knowledge sharing with leading researchers and educators across the country. We foster an exciting and intellectually stimulating atmosphere for all in a co-operative and positive environment.

Mission

To bring confidence in the lifestyle of any Botany student whose stay will ensure proficiency and competency in the subjects thought. We inculcate the habit of excellence in all the learning activities so as to ensure employability.

PROGRAMME OBJECTIVES

1. To impart quality education to meet the demands of higher education and research in Botany
2. To develop a competitive edge among the students to meet out their employability

PROGRAMME SPECIFIC OUTCOMES

- PSO1 To appreciate and understand the diversity of cellular forms, lower plants to higher plants
- PSO2 To introduce the theoretical knowledge and basic concepts on Biomolecules, Microbes, Plant Structure, Function and Evolution
- PSO3 To get hands-on training and practical knowledge in the preparation of microsections, herbarium, quantifying biomolecules and other basic techniques
- PSO4 To create interest in identification of plants using Floral characters, genetic traits and Molecular markers
- PSO5 To update the students with modern trends in Plant biology and introduce the interdisciplinary approach

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE, POLLACHI.

DEPARTMENT OF BOTANY

B.Sc., BOTANY

SCHEME OF EXAMINATION (I - VI SEMESTER)

(FOR CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2019-2022 BATCH)

(CBCS for under graduate programmes with language for 4 semesters)

Part No	Course Code	Course title	Lecture+ Tutorial/ Practical Hours/ week	Duration of Exam Hrs	Max. Marks			Credit Point
					Internal	End-of-Semester	Total	
Semester I								
I	19UTL101	Tamil/Hindi Paper – I	6	3	25	75	100	3
II	19UEN101	English Paper – I	5	3	25	75	100	3
III	19UBY101	Major Paper I - Plant Diversity I (Phycology, Mycology and Bryology)	9	3	25	75	100	4
	19UZY1A1	Allied - Paper I Zoology	7	3	25	75	100	3
IV	19UHR101	Human Rights	1	2	-	50	50	2
	19HEC101	Human Excellence - Personal values & SKY yoga practice- I	2	2	25	25	50	1
V		Extension Activities (Annexure –I)						
500								16
Semester II								
I	19UTL202	Tamil/ Hindi Paper – II	6	3	25	75	100	3
II	19UEN202	English Paper – II	5	3	25	75	100	3
III	19UBY202	Major Paper II Plant Diversity II (Pteridophytes Gymnosperms and Palaeobotany)	6	3	25	75	100	4
	19UBY203	Major Practical I – Paper III (Plant diversity I & II (Phycology, Mycology and Bryology & Pteridophytes Gymnosperms and Palaeobotany)	2	3	40	60	100	4
	19UZY2A2	Allied - Paper II Zoology	7	3	25	75	100	3
	19UZY2A3	Allied - Paper III Practical	2	3	40	60	100	4
IV	19EVS201	Environmental Studies	2	2	-	50	50	2
	19HEC202	Human Excellence - Family values & SKY yoga practice- II	2	2	25	25	50	1
V		Extension Activities (Annexure –I)						
700								24

Semester III								
I	19UTL303	Tamil/ Hindi Paper – III	5	3	25	75	100	3
II	19UEN303	English Paper – III	6	3	25	75	100	3
III	19UBY304	Major Paper IV- Anatomy and Embryology	9	3	25	75	100	4
	19UCY3A4	Allied Paper IV - Chemistry	8	3	25	75	100	3
IV	19UBY3N1/ 19UBY3N2	Skill based subjects (Non major electives)- Landscape designing/ Herbal cosmetics *Basic Tamil paper I	1	2	-	50	50	2
	19HEC303	Human Excellence - Professional values & SKY yoga practice- III	2	2	25	25	50	1
V		Extension Activities (Annexure –I)						
							500	16
Semester IV								
I	19UTL404	Tamil/ Hindi Paper – IV	5	3	25	75	100	3
II	19UEN404	English Paper – IV	6	3	25	75	100	3
III	19UBY405	Major Paper V – Cell Biology, Biochemistry and Biophysics	6	3	25	75	100	4
	19UBY406	Major Practical II - Paper VI (Anatomy & Embryology, Cell Biology , Biochemistry and Biophysics)	2	3	40	60	100	4
	19UCY3A5	Allied - Paper V- Chemistry	6	3	25	75	100	3
	19UCY3A6	Allied paper VI – Chemistry Practical	2	3	40	60	100	4
IV	19UBY4N3/ 19UBY4N4	Skill based subjects (Non major electives)- (Remote sensing and natural resource management/ Bioinformatics) *Basic Tamil paper II	1	2	-	50	50	2
	19HEC404	Human Excellence – Social values & SKY yoga practice- IV	2	2	25	25	50	1
V		Extension Activities (Annexure –I)			50		50	1
							750	25

Semester V								
III	19UBY507	Major Paper – VII - Taxonomy of Angiosperms	6	3	25	75	100	4
	19UBY508	Major Paper VIII - Microbiology and plant pathology	5	3	25	75	100	4
	19UBY509	Major Paper IX – Genetics and Evolution	5	3	25	75	100	4
	19UBY510	Major Paper X – Genetic Engineering	5	3	25	75	100	4
	19UBY511	Elective -I Mathematics for Biologists	5	3	25	75	100	5
IV	19UBY5S1/ 19UBY5S2	Skill based subjects (Major electives)- Network and Information security/ Cyber Security- Ethical Hacking	1	2	-	50	50	2
	19GKL501	General Knowledge & General Awareness (SBE)	SS	2	-	50	50	2
	19HEC505	Human Excellence - National values & SKY yoga practice- V	2	2	25	25	50	1
							650	26
Semester VI								
III	19UBY612	Major Paper XII – Plant Physiology	6	3	25	75	100	4
	19UBY613	Major Paper XIII – Economic & EthnoBotany	5	3	25	75	100	4
	19UBY614	Major Paper XIV - Plant Biotechnology	5	3	25	75	100	4
	19UBY615	Elective II – Bioinformatics	5	3	25	75	100	5
	19UBY616	Elective – III – Habitat Ecology	5	3	25	75	100	5
	19UBY617	Major Practical III – Paper XV (for V Sem theory papers)	2	3	40	60	100	4
	19UBY618	Major Practical IV (for VI Sem theory papers)	2	3	40	60	100	4
IV	19UBY6S3 19UBY6S4	Skill based subjects (Major electives)- Horticulture & Plant Breeding/ Mushroom cultivation	1	2	-	50	50	2
	19HEC606	Human Excellence - Global values & SKY yoga practice- VI	2		25	25	50	1
							800	33
**Grand total							3900	140

* The credits given are applicable only to the students who opt for Basic Tamil paper and the credits for Human Excellence papers cannot be given to them.

**Grand total should be equal/below 3900 (For UG Programmes); 2550 (For PG Programmes)

SS – Self study, SBE – Skill Based Elective, NME–Non Major Elective

**Bloom's Taxonomy Based Assessment Plan
PART I, II & III**

		Internal : 25			External : 75	
Bloom's Taxonomy Section	Knowledge Level	Section	Mark	Description	Total	
K	K1	1-5 Section-A	5x1	MCQ(One question from each unit)	5	
	K1	6-10 Section-A	5x1	Short answers (One question from each unit)	5	
U	K2	11-15 Section-B	5x5	Short answers Either/ Or type (One question from each unit)	25	
A	K3	16-21 Section-C	4x10	Detailed Four out of six (Question no.16 is compulsory) 17-21 Answer any three	40	
Total					75	

Bloom's Taxonomy Section	Knowledge level	Section	Pattern	External : 50	
				Marks	Total
K	K1	Part A	1-5 Multiple choice with 4 options	5x1	5
U	K2		6-10 Short answers (One question from each unit)	5x1	5
A	K3	Part B	Open choice (5 out of 8 Questions)	5x8	40
Total :					50

- Communicative English and General Awareness papers include 60% objective type of questions and 40% descriptive type of questions
- GK 100% objective type of questions (online exam)
- The marks and credits for Extension activities are given by the corresponding Departments

SYLLABUS

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY101	Course Title	2018-2022
		PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY AND BRYOLOGY)	Semester 1
Hrs/Week: 5			Credits 4

Course Objective

- To understand the morphology, structure, life cycle of the selected forms of Algae, Fungi, Lichens and Bryophyte.
- To appreciate the diversity of lower plants

Course Outcome

K1	CO1	To differentiate lower plants like Algae, Fungi, Lichens and Bryophytes
K2	CO2	To understand the morphology and lifecycle of Algae, Fungi, Lichens, Bryophyte
K3	CO3	To apply different classification systems to appreciate the diversity of lower plants
K4	CO4	To identify the economically important Algae, Fungi, Lichens and Bryophytes

Unit	Content	Hrs
Unit I	General characters of algae - Classification of algae (Fritsch) – Distribution, structure, reproduction and life cycle of the following: Cyanophyceae (<i>Nostoc</i>), Chlorophyceae (<i>Oedogonium</i> , <i>Chara</i>) and Phaeophyceae (<i>Sargassum</i>).	13
Unit II	Distribution, structure, reproduction and life cycle of the following: Rhodophyceae (<i>Polysiphonia</i>) and Bacillariophyceae (<i>Cyclotella</i> & <i>Pinnularia</i>) - *Economic importance of algae.	13
Unit III	General characters of Fungi - Mode of nutrition - Classification of Fungi (Alexopoulos, 1972) - *Economic Importance of Fungi - Structure, reproduction and life cycle of Zygomycetes- <i>Mucor</i> , Ascomycetes – <i>Penicillium</i> , Yeasts	13
Unit IV	Structure, reproduction and life cycle of Basidiomycetes - <i>Puccinia</i> . Lichens: Occurrence, Morphology, structure, Reproduction and Economic importance.	13
Unit V	General characters and classification of Bryophytes (Reimers), Distribution, structure, development and reproduction of <i>Riccia</i> , <i>Anthoceros</i> and <i>Polytrichum</i> .	13

**Self study topics*

Power point Presentations, Seminar ,Quiz, Assignment,

Text Books:

1. Smith, G.M., 1971. Cryptogamic Botany Vol. I Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.
2. Smith, G.M., 1971. Cryptogamic Botany Vol. II Bryophytes & Pteridophytes. Tata McGraw Hill Publishing Co., New Delhi.
3. Sharma O.P. 1992. Text book of Thalophytes. McGraw Hill Publishing Co., New Delhi.

Reference Books:

4. Sharma P. D. 1991. The Fungi, Rastogi & Co., Meerut
5. Hirendra Chandra Gangulee, Kumuel Shankar Das Chittatosh Datta, 1968. 3rdEdn. College Botany Vol. I & II, New central book agency, Calcutta.
6. Dube H. C. 1990. An introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	H	M	H	H
CO3	H	H	M	H	L
CO4	H	H	M	H	L

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. A. Logamadevi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (Zoology)
Course code 19UZY1A1	Course Title		2019-2022
	ANCILLARY BOTANY PAPER - I (PLANT DIVERSITY, ANATOMY, EMBRYOLOGY AND PLANT PATHOLOGY)		Semester 1
Hrs/Week	6		Credits 3

Course Objective

- To appreciate the diversity in lower plants
- To understand the anatomy of angiosperms
- To know the embryo development and fertilization in higher plants
- To teach important plant diseases, causal organisms and control.

Course Outcome

K1	CO1	To recollect the existing diversity among lower plants
K2	CO2	To understand the internal structure and embryology of angiosperms
K3	CO3	To analyze the economically important plant diseases and their control measures
K4	CO4	To obtain the skill of technically draw the plant tissues

Unit	Content	Hrs
Unit I	Structure, life history and *economic importance of the following types: Algae: <i>Chlorella</i> , Diatoms and <i>Polysiphonia</i> , Fungi: <i>Penicillium</i> and <i>Agaricus</i> , Lichens.	16
Unit II	A brief account of the structure, reproduction and life cycle of the following genera (excluding development of sex organs): Bryophyte: <i>Riccia</i> , Pteridophyte: <i>Lycopodium</i> and Gymnosperm: <i>Cycas</i> .	16
Unit III	Simple tissues – parenchyma, collenchyma and sclerenchyma - complex tissues – xylem and phloem - cambium – primary structure and secondary structure of dicot stem.	15
Unit IV	Anther structure – ovule structure – 8-nucleate embryo sac – double fertilization – endosperm (nuclear and cellular) – structure of dicot and monocot embryos (development excluded) – polyembryony - parthenocarpy.	15
Unit V	Study of plant diseases - viral disease (TMV) - bacterial disease (citrus canker) - fungal disease (red rot of sugarcane) – *Plant disease control – physical, chemical and biological methods.	15

**Self study topics*

Power point Presentations, Seminar ,Quiz, Assignment,

Text Books:

1. Hirendra Chandra Gangulee, Kumuel Shankar Das Chittatosh Datta, 1968. 3rdEdn. College Botany Vol. I & II, New central book agency, Calcutta.
2. Pandey B.P, 1986, Text Book of Botany (College Botany) Vol I and II, S.Chand and co. New Delhi.
3. Narayanaswamy, R.V & Rao, K.N .1976. Outlines of Botany, S. Viswanthan. Printers & Publishers, Madras.
4. Bhojwani, S.S. and Bhatnagar, S.P., 2009. The embryology of angiosperms, Vikas publishing house pvt Ltd., New Delhi.
5. Pandey, B.P., 1987. Plant anatomy, 4thEdn., S. Chand & Company, New Delhi.

Reference Books:

6. Gilbert, M. Smith, 1972. Cryptogamic botany: Algae and Fungi, Vol I. 2ndEdn. Tata McGraw Hill Publishing Ltd., New Delhi.
7. Krishnamoorthy, K.V. and K.N. Rao, 1984. Angiosperms, Viswanathan printers pvt Ltd., Chennai.
8. Hirendra Chandra Gangulee and Ashok Kumar Kar, 1970. College Botany Vol II. New Central Book Agency, Calcutta.
9. Katherine Esau, 1953. Plant anatomy, 2ndEdn, Wiley Eastern pvt. Ltd., New Delhi.
10. Vashishta, P.C., 1997. Botany for degree students – Pteridophytes Part IV, S. Chand & Company Ltd., New Delhi.
11. Reinert J. and Bajaj, Y.P.S., 1988. Applied and Fundamental aspects of Plant cell and tissue organ culture, Narosa Publishing house, New Delhi.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	H	H	L
CO2	H	S	H	H	M
CO3	H	S	M	H	M
CO4	H	S	H	H	M

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. E.Neelamathi	Dr. R. Kannan	Dr. M. Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY202	Course Title	2019-2022
		PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY)	Semester 2
Hrs/Week	5		Credits 4

Course Objective

- To study the morphology, life cycle and economic value of selected Pteridophytes, Gymnosperms
- To learn the concept of Evolution and Palaeobotany

Course Outcome

K1	CO1	To appreciate the morphology and lifecycle of Algae, Fungi, Lichens, Bryophyte
K2	CO2	To understand the concepts of evolution, Palaeobotany and evolution of land plants
K3	CO3	To identify the economically important Pteridophytes and Gymnosperms
K4	CO4	To analyse the fossil slides and specimen

Unit	Content	Hrs
Unit I	Pteridophytes: General characters and classification of Pteridophytes (Reimers) - stelar evolution - heterospory and origin of seed habit – structure, development and reproduction of Psilotopsida (<i>Psilotum</i>) and Lycopsidea (<i>Lycopodium</i>)	13
Unit II	Structure, development and reproduction of Sphenopsida (<i>Equisetum</i>) and Pteropsida (<i>Marsilea</i>). *Economic importance of Pteridophytes.	13
Unit III	Gymnosperms: General characters and classification of Gymnosperms (Sporne, 1965) – structure, development and reproduction of <i>Cycas</i> .	13
Unit IV	Structure development and reproduction of <i>Gnetum</i> – affinities of <i>Gnetum</i> with Angiosperms *Economic importance of Gymnosperms.	13
Unit V	Palaeobotany: Geological time scale – fossils - fossilisation - kinds of fossils - detailed study of <i>Rhynia</i> , <i>Lepidodendron</i> , <i>Lepidocarpon</i> , <i>Lepidostrobus</i> and <i>Williamsonia</i> .	13

**Self study topics*

Power point Presentations, Seminar ,Quiz, Assignment,

Text Books:

1. Smith, G.M., 1971. Cryptogamic Botany Vol. II Bryophytes & Pteridophytes. Tata McGraw Hill Publishing Co., New Delhi.
2. Hirendra Chandra Gangulee, Kumuel Shankar Das Chittatosh Datta, 1968. 3rdEdn. College Botany Vol. II, New central book agency, Calcutta.
3. Sporne K.R. 1991. The morphology of Gymnosperms. B.I. Publications Pvt. Bombay Calcutta, Delhi.

Reference Books:

4. Sharma O.P. 1992. Text book of Pteridophyta, Macmillan India Ltd., New Delhi.
5. Wilson, N.S. and Rothwell, G.W. 1993. Palaeobotany and the evolution of plants (2nd edition), Cambridge University Press, UK.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	M	M	H
CO2	S	H	M	M	L
CO3	S	H	H	M	H
CO4	S	S	L	M	L

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr.M.Latha Isabel	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY203	Course Title	2019-2022
		MAJOR PRACTICAL - I (PLANT DIVERSITY I & II)	Semester 2
Hrs/Week	2		Credits 4

Course Objective

- To get hands on knowledge on microbial culture techniques
- To understand the plant diversity, thallus organization of selected forms
- To learn about the fossilized plant forms and Plant evolution.

Course Outcome

K1	CO1	To revise the morphology and reproductive structures in Algae, Fungi, Lichens, and Bryophyte
K2	CO2	To get the picture of internal structures and spore bearing parts of selected plant forms
K3	CO3	To compare the life cycles of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms
K4	CO4	To prepare micro sections and to professionally draw plant sketches, to identify fossil specimen and slides

Unit	Content	Hrs
Unit I	A detailed study of thallus organization and reproductive structures of the following forms: Algae – <i>Nostoc</i> , <i>Oedogonium</i> , <i>Chara</i> , <i>Sargassum</i> , <i>Polysiphonia</i> , <i>Cyclotella</i> and <i>Pinnularia</i> . Fungi - <i>Mucor</i> , <i>Penicillium</i> , Yeasts and <i>Puccinia</i> . Lichen – <i>Usnea</i> .	5
Unit II	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: Bryophytes - <i>Riccia</i> , <i>Anthoceros</i> and <i>Polytrichum</i> .	5
Unit III	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: Pteridophytes – <i>Psilotum</i> , <i>Lycopodium</i> <i>Equisetum</i> and <i>Marsilea</i> .	5
Unit IV	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: Gymnosperms - <i>Cycas</i> and <i>Gnetum</i> .	6
Unit V	A detailed study of the following fossil genera <i>Rhynia</i> , <i>Lepidodendron</i> , <i>Lepidocarpon</i> , <i>Lepidostrobus</i> and <i>Williamsonia</i> from fossil specimen/parts or slides.	6

Preparing micro sections and mounting, Spotters, Specimen, Slides.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	H	L
CO2	S	M	S	H	H
CO3	S	M	S	H	L
CO4	S	M	S	H	M

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran
Dr.K.Rajalakshmi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (Zoology)
Course code 19UZY2A2	Course Title		2019-2022
	ANCILLARY BOTANY PAPER - II (TAXONOMY OF ANGIOSPERMS, PHYSIOLOGY, HORTICULTURE, MEDICINAL BOTANY & PLANT BIOTECHNOLOGY)		Semester 2
Hrs/Week	6		Credits 3

Course Objective

- To know the diversity in flowering plants
- To understand the physiology of angiosperms
- To learn the available horticultural techniques to raise new plantlets
- To study the selected medicinal plants and popular drugs from them
- To understand the basics of plant biotechnology

Course Outcome

K1	CO1	To appreciate the morphology and lifecycle of selected Angiosperms
K2	CO2	To understand the concepts of Plant functions, Plant propagation, Plant tissue culture
K3	CO3	To identify flowering plants and medicinal plants in their habit.
K4	CO4	To know-how different cutting, layering, grafting, budding methods to propagate different plants

Unit	Content	Hrs
Unit I	Plant Morphology (Terms only) - Vegetative and floral characters and Economic importance of the following families: Annonaceae, Rutaceae, Rubiaceae, Acanthaceae, Amarantaceae, Euphorbiaceae and Liliaceae.	16
Unit II	Photosynthesis – A brief account of light and dark reactions with reference to C3 plants – respiration – glycolysis, krebs cycle, oxidative phosphorylation – growth regulators – auxins, gibberellic acid and ABA.	16
Unit III	Horticulture: Seed propagation- asexual propagation and its advantages – cutting, layering, grafting and budding – * hydroponics – bonsai.	15
Unit IV	Pharmacognosy – definition and history – drugs obtained from algae (<i>Spirulina</i>), fungi (<i>Penicillium</i>), gymnosperms (<i>Ginkgo</i>) and angiosperms (<i>Rauwolfia serpentina</i> and <i>Phyllanthus amarus</i>) – nutraceuticals.	15
Unit V	Plant Biotechnology – plant tissue culture: totipotency – micropropagation – meristem culture – Transgenesis – Genetically modified food (Bt cotton and * Golden rice).	15

*Self study topics

Power point Presentations, Seminar ,Quiz, Assignment
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Text Books:

1. Hirendra Chandra Gangulee, Kumuel Shankar Das Chittatosh Datta, 1968. 3rdEdn. College Botany Vol. I & II, New central book agency, Calcutta.
2. Susil Kumar Mukerjee, 1984. College botany, Vol.III. New Central Book agency, Calcutta.
3. Jain, V.K., 1974. Fundamentals of plant physiology, 6th Edn., S. Chand & Company Ltd., New Delhi.

Reference Books:

4. George, H.M., Lawrence, 1958. Taxonomy of vascular plants. The Macmillan Company, Newyork.
5. Pandey, B.P. 1997. Economic botany, C. Chand & Company Ltd., New Delhi.
6. Salisbury, F.B. and Rose, 1986. Plant physiology, 3rdEdn, C.B.S. Publishers, New Delhi.
7. Kumar, N., Abdul Khader, JBM., M.D. Rangaswami, P. and I.Irullappan, 1993. Introduction to species, Plantations crops, Medicinal and aromatic plants, Rajalakshmi publication, Nagercoil, Tamilnadu, India.
8. Wallils, T.E.,1985. Text book of pharmacognosy, 5thEdn. CBS publishers & distributors, Delhi.
9. Kumaresan, V., 1998. Biotechnology. Tata McGraw Hill Publishing Company Ltd., New Delhi.
10. Ignacimuthu, S.,1996. Applied Biotechnology. Tata McGraw Hill Publishing Company Ltd., New Delhi.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	L
CO2	M	S	M	M	M
CO3	S	H	M	S	M
CO4	L	M	H	M	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr.K.Rajalakshmi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (Zoology)
Course code	19UZY2A3	Course Title	2019-2022
		ANCILLARY BOTANY PRACTICAL	Semester 2
Hrs/Week	2		Credits 4

Course Objective

- To know the diversity, morphology, anatomy and reproductive structures of selected lower plants and higher plants.
- To impart the basic plant breeding, horticultural techniques and plant diseases.
- To introduce important medicinal plants and principles of plant biotechnology

Course Outcome

K1	CO1	To recollect some selected lower plants and higher plants in their habit
K2	CO2	To understand the internal structure, embryology and physiology of angiosperms
K3	CO3	To analyze the economically important plant diseases and their control measures
K4	CO4	To prepare microsections and obtain the skill of technically draw the plant tissues
K5	CO5	To propagate plants using simple horticultural techniques

Unit	Content	Hrs
Unit I	Plant Biodiversity Algae- <i>Chlorella</i> , Diatoms and <i>Polysiphonia</i> , Fungi- <i>Penicillium</i> and <i>Agaricus</i> , Lichens - <i>Usnea</i> , Bryophyte - <i>Riccia</i> , Pteridophyte - <i>Lycopodium</i> and Gymnosperm - <i>Cycas</i> , Symptoms and causal organisms and control measures of TMV, citrus canker and red rot of sugarcane.	6
Unit II	Plant Anatomy and Embryology Parenchyma, collenchyma, sclerenchyma, xylem and phloem. Primary structure of dicot stem (<i>Tridax</i>), secondary structure of dicot stems (<i>Tridax</i> and <i>Polyalthia</i>). Permanent slides - structure of anther, ovule, embryo sac and embryo.	6
Unit III	Taxonomy of Angiosperms Morphology – Diagrams - A detailed study of the following families: Annonaceae, Rutaceae, Rubiaceae, Acanthaceae, Amarantaceae, Euphorbiaceae and Liliaceae.	5
Unit IV	Plant Physiology (Demonstration) Photosynthesis - test tube and funnel experiment and light screen experiment. Respiration – Ganong’s respiroscope (aerobic) and Kuhn’s fermentation (anaerobic). Horticulture: Charts on cutting, layering and grafting.	5
Unit V	Medicinal Botany & Plant Biotechnology Study of following medicinal plants: <i>Spirulina</i> , <i>Penicillium</i> , <i>Ginkgo</i> , <i>Rauwolfia serpentina</i> and <i>Phyllanthus amarus</i> . Plant biotechnology charts.	5

Slides, Demonstrations, Simple experiments using apparatus, Power point Presentations,

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	S	L	H	S	M
CO3	S	M	S	H	M
CO4	S	L	S	H	H
CO5	M	M	H	H	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY304	Course Title	2019 -2022
		ANATOMY AND EMBRYOLOGY	Semester 3
Hrs/Week	5		Credits 4

Course Objective

- To acquire knowledge about the entire plant growth and development.
- To know various anatomical features of flowering plants
- To understand the important events in embryo development and fertilization.

Course Outcome

K1	CO1	To know the theories on plant cell, tissues and cell division
K2	CO2	To understand the anatomy of various plant parts
K3	CO3	To analyze the internal structure and embryology of angiosperms
K4	CO4	To compare the growth and developmental pattern of dicots and monocots

Unit	Content	Hrs
Unit I	Anatomy: Plant body – cell types and tissues – meristems - Apical meristem – Shoot and root – theories – Cambium and its functions - permanent tissues - simple and complex – Vascular bundles and its types – differentiation – dedifferentiation – redifferentiation.	13
Unit II	Primary structure of stem and root (monocot and dicot) – normal secondary growth in dicot stem and dicot root – anomalous secondary growth in dicot stem (<i>Boerhaavia</i>) and monocot stem (<i>Dracaena</i>) - dicot root (<i>Achyranthes</i>) - wood structure (sap wood & heartwood).	13
Unit III	Leaf – epidermal tissues – trichomes – stomatal types – internal structure of monocot (Grass) and dicot (<i>Tridax</i>) leaves. Anatomy of hydrophytic leaf (<i>Hydrilla</i>) and xerophytic leaf (<i>Casuarina</i>). *Structural modifications in stems, root and leaves.	13
Unit IV	Embryology: Flower – Anther structure - microsporangium - microsporogenesis – structure & development of male gametophyte – ovule – types –megasporangium - megasporogenesis (<i>Polygonum</i> type) – structure and development of female gametophyte – types of embryosac.	13
Unit V	Pollination – double fertilization and triple fusion – endosperm – types – embryo – structure and development - dicot (<i>Capsella</i>) and monocot (<i>Najas</i>) – polyembryony – formation of seed – fruit – *parthenocarpy.	13

**Self study topics*

Charts, Powerpoint presentation, Seminar, Quiz, Assignment
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Text Books:

1. Bhojwani S.S. and Bhatnagar, S.P., 2000. The embryology of angiosperms. 4th edition, Vikas printing houses, New Delhi.
2. Esau K. 1977. Anatomy of seed plants. 2nd edition. John Wiley & Sons, New York.
3. Vashista P.C., 1997. Plant Anatomy, S. Chand & Co., New Delhi.

Reference Books:

4. Fahn A., 1974. Plant Anatomy, 2nd edition. Pergamon Press, Oxford.
5. Pandey B.P., 1985. Plant Anatomy, S and Chand & Co., New Delhi.
6. Maheswari P., 1971. An introduction to embryology of angiosperms. Tata McGraw Hill Publishing Co., New Delhi.
7. Swamy B.G.L. and Krishnamurthy, K.V., 1980. From flower to fruit: Embryology of Angiosperms, Tata McGraw Hill Publishing Co., New Delhi.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	H	M	M
CO2	H	S	H	M	L
CO3	M	H	M	H	M
CO4	H	H	H	M	L

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY3N1	Course Title	2019-2022
		SKILL BASED ELECTIVE (NON MAJOR): LANDSCAPE DESIGNING	Semester 3
Hrs/Week	1		Credits 2

Course Objective

- To introduce the scope and essential elements of landscape.
- To learn various garden structures.

Course Outcome

K1	CO1	To know the Gardening types and features
K2	CO2	To understand the Landscape designing principles
K3	CO3	To analyze the uniqueness of indoor garden
K4	CO4	To create interest in making flower arrangements, kitchen garden and terrarium

Unit	Content	Hrs
Unit I	Landscape designing – principles and categories of landscaping - important ornamental plants – habit and types.	3
Unit II	Gardening – indoor garden: hanging baskets and terrarium – layout and importance of terrace garden – public garden and its components.	3
Unit III	Garden features - Lawn: layout – preparation of land – propagation – irrigation – weeding – pruning.	2
Unit IV	Glass house: applications and advantages - rockery – hydroponics – topiary - bonsai.	2
Unit V	Flower arrangement - cut flowers - role of botanical garden - <i>ex situ</i> , <i>in situ</i> conservation.	2

Text Books:

1. Kumar N., 1993. An introduction to horticulture, TNAU, Coimbatore.
2. Mani BhusanRao, 1964. Text book of Horticulture. Macmillan India Ltd., Newdelhi.
3. Pratibhatrivedi, 1996. Home Gardening. Indial Council of Agricultural Research, New Delhi.

Reference Books:

4. George Acquaah, 2004. Horticulture – principles and practices. Prentice Hall of India Pvt Ltd., New Delhi.
5. Edmond, 1988. Fundamentals of Horticulture. MCGH Publications New Delhi.
6. Satya P. 2012. Plant Breeding. Books and allied Pvt Ltd. Kolkatta.

Powerpoint presentation, Discussion, Demonstration

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	H	H	H	H	H
CO3	H	H	H	M	H
CO4	S	H	S	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY3N2	Course Title	2019-2022
		SKILL BASED ELECTIVE (NON MAJOR): HERBAL COSMETICS	Semester 3
Hr/Week	1		Credits 2

Course Objective

- To understand the role of herbs as a source of natural and safe cosmetics.

Course Outcome

K1	CO1	To recollect the medicinal herbs and the need for herbal cosmetics
K2	CO2	To comprehend the principles behind herbal cosmetics
K3	CO3	To analyze the various personal care remedies using herbs
K4	CO4	To expose the students to prepare home recipes with available herbs

Unit	Content	Hrs
Unit I	Herbal cosmetics – introduction – principles – definition – history – scope and limitations.	3
Unit II	Herbal skin and hair care – face glow - dark circle remover - tools – ingredients – recipes	3
Unit III	SPA – origin and history – ayurvedic spa – aromatherapy – special spa treatments.	2
Unit IV	Manicure and pedicure – history – definition – techniques – benefits.	2
Unit V	Herbal home recipes – herbal shampoo - soap - hair colorant – tooth powder.	2

Text Books:

- Babu,S.S., 2000. Herbal cosmetics - Pushkal publishers, Mumbai.
- Asharam,2002.Herbal Indian perfumes and cosmetics, Sri Satguru publications, New Delhi, India

Powerpoint presentation and Demonstration

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	H	H
CO2	H	S	H	L	H
CO3	H	H	H	L	H
CO4	S	H	S	S	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. A. Logamadevi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code 19UBY405	Course Title		2019-2022
	CELL BIOLOGY, BIOCHEMISTRY AND BIOPHYSICS		Semester 4
Hrs/Week	5		Credits 4

Course Objective

- To know the structure of plant cell, cell organelles and biochemical molecules of life
- To understand the biophysical laws governing universe

Course Outcome

K1	CO1	To recollect the details about Plant cell, organelles, and their functions
K2	CO2	To revisit the structure and functions of biomolecules
K3	CO4	To understand the biophysical forces and laws of thermodynamics
K4	CO5	To know-how the quantification of biomolecules using selected optical techniques and to analyze the biomolecules using simple separation techniques

Unit	Content	Hrs
Unit I	Cell biology: *Ultra structure of Plant cell. Structure and functions of cell wall – plasma membrane – extra cellular matrix – chloroplast - mitochondria – endoplasmic reticulum. Structure and functions of ribosomes - dictyosomes - nucleus - nucleolus – chromosomes - Giant chromosomes: polytene and lamp brush – mitosis	13
Unit II	Biochemistry: Biomolecules – structure, classification and functions of carbohydrates (* monosaccharides and polysaccharides), proteins and lipids.	13
Unit III	Structure and function of nucleic acids (DNA and RNA) – Types of RNA - DNA replication. Enzymes: Classification, nomenclature, properties and functions – mechanism of enzyme action	13
Unit IV	Biophysics: Chemical bonds (covalent, non-covalent and ionic) vander waal's forces - laws of thermodynamics - redox potential - redox couple - energy states of atom - spin property of electrons – Pauli's exclusion principle - absorption spectrum in molecules.	13
Unit V	Bioinstrumentation: Principle, types and uses of pH meter–centrifuge – chromatography (paper, column, thin layer, gas, ion-exchange and affinity) – electrophoresis (AGE & PAGE) - Colorimetry: principle and laws (Lambert's and Beer's) – Colorimeter and Spectrophotometer	13

**Self study topics*

Powerpoint presentation, Seminar, Quiz, Assignment, Demonstration

Text Books:

1. Verma P.S. and Agarwal, 2001. Cell biology. S. Chand & Company, New Delhi, India.
2. Jain J.L., 1999. Fundamentals of Biochemistry, S. Chand & Company, New Delhi, India.
3. Subramanian P., 2005. Biophysics: Principles and techniques, MJP Publishers, Chennai.

Reference Books:

4. De Robertis E.D.P., and De Robertis, E.M.F., 1995. Cell and molecular biology, 8thedn. BI. Waverly Pvt. Ltd., New Delhi.
5. Alberts B., Bray, D., Lewis, J. Raff, M. Roberts, K. and Watson, J.D., 1998. Molecular biology the cell. 2nd edn., Garland Pub. Inc., New Delhi.
6. Conn E.E., Stumps, G., Brueming and Doi, R.G., 1987. Outlines of biochemistry, John Wiley & Co., Newyork.
7. Jayaraman J., 1988. Laboratory Manual in Biochemistry. Wiley Eastern Ltd., New Delhi.
8. Lee P.J. and Leegood, R.C., 1999. Plant biochemistry and molecular biology. John Wiley & Sons, Chichester, England.
9. Voet and Voet, 1995. Principles of biochemistry, WCB Publishers, London

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	H	M	H
CO2	M	S	M	L	H
CO3	M	S	H	H	H
CO4	M	H	S	M	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY406	Course Title	2019-2022
		MAJOR PRACTICAL – II (CYTOLOGY, ANATOMY & EMBRYOLOGY & BIOCHEMISTRY AND BIOPHYSICS)	Semester 4
Hrs/Week	2		Credits 4

Course Objective

- To learn various anatomical features of higher plants
- To know the structure and development of anther, ovary, embryo

Course Outcome

K1	CO1	To recollect the internal structure and functions of angiospermic plants
K2	CO2	To understand the working principle of selected instruments
K3	CO3	To analyze the developmental details of plant embryo
K4	CO4	To prepare permanent micro sections
K5	CO5	To obtain working knowledge in basic biochemical techniques

Unit	Content	Hrs
Unit I	Cell biology: Charts of prokaryotic & eukaryotic cell and cell organelles, DNA, RNA models.	6
Unit II	Anatomy: Plant parts, cell - tissue types - mitosis Stem: shoot apex, primary structure of dicot stem (<i>Tridax</i> and <i>Cucurbita</i>), monocot stem (<i>Sorghum</i>) - normal secondary thickening in a dicot stem (<i>Thespesia</i>) - anomalous secondary thickening in <i>Boerhaavia</i> and <i>Dracaena</i> stems. Leaf: stomatal types, dicot (<i>Nerium</i>) and monocot (Grass). Root: root apex, primary structure of dicot root (<i>Dolichos</i>), monocot root (<i>Canna</i>) - normal secondary thickening in and dicot root (Castor). Anomalous secondary thickening in <i>Achyranthes</i> root.	6
Unit III	Embryology: Flower: Permanent slides on structure of anther, ovule, embryosac and endosperm (coconut and areca endosperm) - embryo dissection (<i>Tridax</i> and <i>Waltheria</i>), Pollinium dissection (<i>Calotropis</i>).	5
Unit IV	Biochemistry & Bioinstrumentation: <ul style="list-style-type: none"> • Complementary colours • Verification of Beer's law • Absorption spectrum & Chlorophyll estimation • Standard graph preparation • Estimation of carbohydrate using spectrophotometer • Estimation of sugar using Benedicts reagent 	5
Unit V	<ul style="list-style-type: none"> • Leaf pigment separation using TLC and paper chromatography • Separation of cell organelles using centrifuge • Estimation of pH in water samples using pH meter • Preparation of buffers 	5

	<ul style="list-style-type: none"> Working principle of centrifuge, pH meter, colorimeter, spectrophotometer, electrophoresis and PCR. 	
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Preparation of microsections of selected plants, plant parts and discussing their anatomical details, Separation and Quantification of biomolecules using simple apparatus, Demonstrations

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	M	M
CO2	L	S	S	M	H
CO3	M	H	M	L	S
CO4	S	M	S	M	S
CO5	H	M	S	M	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr. R. Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY4N3	Course Title	2019-2022
		SKILL BASED ELECTIVE (NON MAJOR) – REMOTE SENSING AND NATURAL RESOURCE MANAGEMENT	Semester 4
Hr/Week	1		Credits 4

Course Objective

- To study the basic principles of remote sensing techniques
- To understand the role of GIS, GPS in managing Natural resources

Course Outcome

K1	CO1	To list down the natural resources and biosphere reserves
K2	CO2	To understand the concept of Remote sensing
K3	CO3	To apply remote sensing techniques in Resource management
K4	CO4	To update the recent trends in remote sensing techniques

Unit	Content	Hrs
Unit I	Natural resources – Terrestrial and aquatic (Forest and marine resources) – Biodiversity – Concept – Conservation strategies (<i>in situ</i> and <i>ex situ</i>) – Biosphere reserves – National Parks and Wildlife sanctuaries – IUCN species status.	3
Unit II	Remote sensing – Concept, platforms for remote sensing, satellites, sensors and satellite data products – Interpretation of remotely sensed data-Visual interpretation and digital analysis.	3
Unit III	Remote sensing and vegetation studies – Forest mapping-Land cover classification and change detection studies.	2
Unit IV	Remote sensing for marine resource management – Coastal vegetation surveys – Marine pollution monitoring.	2
Unit V	Recent trends in remote sensing techniques – Role of GIS (Geographical Information System) and GPS (Global Positioning System), IRNSS – National and International Agencies and their achievements.	2

Power point presentations, Quiz,

Text Books:

1. Thomas Eugene Avery and GraydonLennis Berlin, 1992. Fundamentals of Remote sensing and Airphoto Interpretation.
2. Agrawal K. C., 1996. Biological diversity, Agro Botanical Publishers, New Delhi.

Reference Books:

3. Solbris, Van Embden and Van dordt., 1994. Biodiversity and global changes. CAB International, International Union of Biological Sciences, Wallingford.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	L
CO2	M	S	M	M	S
CO3	H	S	M	L	S
CO4	M	M	M	M	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr. R. Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY4N4	Course Title	2019-2022
		SKILL BASED ELECTIVE (NON MAJOR) -BIOINFORMATICS	Semester 4
Hr/Week	1		Credits 2

Course Objective

- To introduce classical bioinformatics theory to students
- To focus computer science techniques used in biological studies

Course Outcome

K1	CO1	To introduce Bioinformatics and Biological databases
K2	CO2	To comprehend the origin of life and genetic code
K3	CO3	To know-how the gene finding, protein prediction and genetic algorithm
K4	CO4	To analyze the phylogeny between species using pattern recognition and homology

Unit	Content	Hrs
Unit I	Life - origin and evolution – biomolecules – book of life - genetic code – genomics and proteomics – Human Genome Project.	3
Unit II	Introduction to bioinformatics – biological databases and searching tools – virtual library – servers for bioinformatics – IT tools for bioinformatics.	3
Unit III	Genetic algorithm – sequence analysis – alignment and similarity search-pattern recognition – structure prediction.	2
Unit IV	Gene finding – protein prediction – tools and databases for biomolecular visualization – drug designing.	2
Unit V	Phylogenetic analysis – tools and databases for phylogenetic tree construction – homology – orthology – paralogy – analogy.	2

Powerpoint presentations, Quiz

Text Books:

1. Lesk A.M.2002, Introduction to Bioinformatics, Oxford University Press,Oxford.
2. Parthasarathy S., 2008. Essentials of programming in C for life sciences. Ane Books India, New Delhi.
3. Sundararajan S. and R. Balaji, 2002. Introduction to Bioinformatics, Himalaya Publishing House – Mumbai.

Reference Books:

4. Chakraborty C., 2004. Bioinformatics Approaches and Application. Chawla offset printers – Delhi.
5. Westhead D.R., J. Parish and R.M.Twyman, 2003. Bioinformatics (instant notes) Viva books private limited – New Delhi.
6. KhanI.A.,and A. Khanum, 2002, Emerging trends in Bioinformatics, Ukaaz Publications.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S
CO2	H	S	L	M	S
CO3	M	S	M	M	S
CO4	M	S	L	M	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr.R.Kannan	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY507	Course Title	2019-2022
		TAXONOMY OF ANGIOSPERMS	Semester 5
Hrs/Week	5		Credits 4

Course Objective

- To learn nomenclature systems and to identify the plants
- To introduce modern trends in taxonomy
- To know the economic uses of plants

Course Outcome

K1	CO1	To introduce and list down the technical terms used in taxonomy
K2	CO2	To understand the principle and classification of angiosperms
K3	CO3	To create interest in identifying flowering plants in and around the campus
K4	CO4	To get hands-on training in preparing herbarium
K5	CO5	To update the Botanical nomenclature, norms and digital taxonomy

Unit	Content	Hrs
Unit I	Introduction to plant taxonomy – principles - morphology and technical terms used in taxonomy (root, stem, leaf, inflorescence, flowers and fruits) – Systems of classification – natural (Bentham & Hooker) and artificial (Linnaeus) and APGA - merits and demerits.	13
Unit II	Botanical nomenclature - ICBN (ICN) – typification - author citation - valid publication - herbarium techniques – floras - * Botanical survey of India (BSI) and its function. Modern trends in taxonomy - digital taxonomy – para taxonomy - online herbaria - * Royal botanical garden.	13
Unit III	Detailed study of the range of characters and economic importance of the families: Polypetalae: Annonaceae, Capparidaceae, Rutaceae, Anacardiaceae, #Fabaceae, Cucurbitaceae and Apiaceae. Gamopetalae: Rubiaceae, Apocynaceae, Asteraceae.	13
Unit IV	Detailed study of the range of characters and economic importance of the families: Gamopetalae: #Asclepiadaceae, Scrophulariaceae, Acanthaceae, and #Lamiaceae. Monochlamydeae: Amaranthaceae, Euphorbiaceae.	13
Unit V	Monocots: #Orchidaceae, Cannaceae, #Liliaceae, Arecaceae, and Poaceae. # <i>Pollination mechanisms to be included.</i>	13

*Self study topics

Field study, Identification of plants in the campus, Herbarium preparation
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Text Books:

1. Chopra G.L., 2004 Angiosperm (Systematics and life cycles), Pradeep publications. Jalandhar.
2. PandeyB.P., 1997. Taxonomy of angiosperms. Chand and Co. Ltd. New Delhi.
3. PandeyB.P., 1980.Economic Botany, Chand and Co. Ltd. New Delhi.

Reference books:

4. SharmaO.P., 1993. Plant taxonomy, Tata McGraw-Hill Education,
5. VasishtaP.C., 1994. Taxonomy on angiosperms. S. Chand & Co., New Delhi
6. Gamble J.S.1967. Flora of Madras, Vol. I, II & III. Govt. of India.
7. Jeffrey C., 1976. An introduction to plant taxonomy. Allied publication.
8. Lawrence .G.H.M., 1964. An introduction to plant taxonomy, Central Book dept., Allahabad.
9. Porter C.L., 1969. Taxonomy of flowering plants. Eurassia Publication House, New Delhi.
10. Rendle A.B., 1980. The classification of flowering plants (Vol. 1& 2), Vikas students Edn.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	M	S
CO2	S	H	M	H	M
CO3	S	M	M	S	M
CO4	S	M	S	S	S
CO5	S	L	L	S	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran
Dr. A. Logamadevi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY508	Course Title	2019-2022
		MICROBIOLOGY AND PLANT PATHOLOGY	Semester 5
Hrs/Week	5		Credits 4

Course Objective

- To know the microbial biodiversity
- To learn the techniques in bacteriology and immunology
- To know plant diseases and its control

Course Outcome

K1	CO1	To appreciate the diversity of microbes
K2	CO2	To understand the basic defence mechanism and concept of Immunology
K3	CO3	To analyse the food and water samples for contamination
K4	CO4	To get hands-on training in culturing microbes
K5	CO5	To learn economically important plant disease

Unit	Content	Hrs
Unit I	Bacteriology: Bacteria - morphology and ultra structure – major features – nutritional types – bacterial respiration - growth and reproduction – *economic importance - culture media and techniques (spread plate, pour plate and streak plate).	15
Unit II	Virology: Virus – characteristics - ultra structure, shape, classification (bacterial, plant and animal viruses) - transmission and reproduction (HIV, Rabies & T4 Phage).	15
Unit III	Immunology: host microbe interaction - antigen, antibody and vaccines - antibiotics - source and mode of action of penicillin and streptomycin - control of microorganisms - chemotherapy.	15
Unit IV	Food, soil and water microbiology: microbial flora of fresh food - food spoilage and poisoning (botulism) - *food preservation -microbial flora of milk - pasteurization and dairy products - cheese production- production of ethanol, vinegar and citric acid. Microbiology of soil and water – soil microbial flora - detection of coliforms - MPN and MFT.	15
Unit V	Plant pathology: Introduction - brief history - classification of plant diseases - Koch's postulate - symptoms, causal organism and control measures of bacterial (citrus canker), fungal (tikka disease of ground nut, paddy blast, and red rot of sugarcane) and viral (TMV) diseases – biocontrol - biopesticides.	15

**Self study topics*

Powerpoint presentation, Field observation of diseased plants, Quiz, Seminar, Assignment
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Text Books:

1. Ananthanarayanan and Jayaramanikar, Textbook of microbiology, 2017 (10th Edn.)Universities press, Hyderabad.
2. Pelczar JR., M.J., R.D. Reid and E.C.S. Chan, 1983. Microbiology (4thed.) Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi.
3. Purohit, S.S., Microbiology – Fundamentals & applications, 2006, Agro Bios (India)..
4. Sharma, .P.D., Plant Pathology, Deep and Deep Publications, New Delhi.

Reference Books:

1. Atlas R.M., 1996. Principles of Microbiology. Wm.C. Brown Publishers
2. Black, J.G., Microbiology –II Edition, Prentice Hall publications.
3. Churchill, Immunobiology- The Immune System in Health and Disease. Livingstone publication. New York.
4. Hans G. Schlegel, General Microbiology, 7thed, Cambridge Low Price Edns
5. Kenneth J. Ryan, C. George Ray, Sherris Medical Microbiology: An Introduction to Infectious Diseases.
6. Prescott, L.M., Harley JP and Klein DA., 1990. Microbiology. Wan C.Publishers.
7. Rose, A.H., Chemical Microbiology, 3rded, Butterworth World Student Reprints.
8. Salle.A.J., Fundamental Principles of Bacteriology, Tata McGraw Hill.
9. Stanier R., General Microbiology, 5thed, Macmilan Press ltd.

CO \ PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	M	H
CO2	M	S	M	M	M
CO3	M	H	H	L	M
CO4	M	M	H	L	S
CO5	M	M	M	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. A. Logamadevi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY509	Course Title	2019-2022
		GENETICS & EVOLUTION	Semester 5
Hrs/Week	5		Credits 4

Course Objective

- To learn the principles and theories of inheritance
- To know the concepts of classical and modern genetics

Course Outcome

K1	CO1	To revise the Mendelian Genetics
K2	CO2	To understand the concept of gene and molecular basis of heredity
K3	CO3	To learn the significance of Meiosis
K4	CO4	To analyse the causes of mutation and DNA repair mechanisms

Unit	Content	Hrs
Unit I	Introduction to Genetics - Mendelian inheritance- *Mendel and his experiments with pea plant – Mendels’ laws - law of dominance – incomplete dominance – law of segregation - law of independent assortment – Monohybrid cross - dihybrid cross - back and test crosses.	13
Unit II	Non-Mendelian inheritance -interaction of genes –complementary genes – supplementary genes – duplicate genes - inhibitory genes – polygenic inheritance – multiple alleles and blood groups in man.	13
Unit III	Meiosis - crossing over – chromosome maps – linkage – sex linkage – types of sex linkage – sex linked inheritance – cytoplasmic inheritance – chloroplast and mitochondrial inheritance - sex determination – chromosomal – genic balance – hormonal and environmental sex determination.	13
Unit IV	Chemical basis of heredity - DNA as genetic material (McCleod and Mc Carty experiments) - RNA as genetic material (Frankel-Conrat experiment) – concept of gene - genetic code - features and properties – prokaryotic (lac operon) and eukaryotic gene expression and regulation	13
Unit V	Mutations - causes of mutation - mutagenic agents – gene mutation - DNA repair mechanisms (photo reactivation, excision and recombinational) - chromosomal aberrations - ploidy - significance of polyploidy. Introduction to Evolution – *origin of life – theories of evolution – Lamarck, Darwin and Hugo De Vries – Wisemann theory.	13

**Self study topics*

Powerpoint presentation, Slides, Quiz, Seminar, Assignment
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Text Books:

1. Sinnot, Dunn and Dobshansky, Principles of Genetics. McGraw Hill Pub.
2. Verma P. S. and V. K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd., New Delhi.
3. Chawala H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company, New Delhi.
4. Gifford, E. M. and Foster, A.S. 1989. Morphology and evolution of vascular plants. W.H. Freeman & Co., Newyork.

Reference Books:

5. Verma P. S. and V. K. Agrawal. 2006. Genetics. S. Chand & Company Ltd., New Delhi.
6. Goodenough V., 1992. Genetics, Saunders College publishing.
7. Kenny *et al.*, Gene regulation and its expression. Plenum press.
8. Lawin, Molecular basis of gene expression. Wiley & Sons.
9. Lewin B. 2002. Genes VII. OxfordUniversity Press, Oxford.
10. Snustad D. P. and M. J. Simmons. 2000. Principles of Genetics. John Wiley & Sons,Inc.,
11. Strickberger M. W. 1990. Genetics (3rd Ed.). Macmillan Publishing Company. USA.
12. Watson J.D. *et al.*, Molecular Biology of the gene. The Benjamin/Cummings.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	M	L
CO2	M	S	L	M	S
CO3	H	S	M	M	M
CO4	M	S	M	M	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. R. Kannan	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY510	Course Title	2019-2022
		GENETIC ENGINEERING	Semester 5
Hrs/Week	5		Credits 4

Course Objective

- To study the basic principles of Genetic engineering
- To learn the tools and techniques in Genetic engineering

Course Outcome

K1	CO1	To revisit the molecular tools in genetic engineering
K2	CO2	To understand the principle of gene transfer blotting techniques and DNA amplification
K3	CO3	To analyse the molecular markers and its applications
K4	CO4	To apply the rDNA safety guidelines

Unit	Content	Hrs
Unit I	*Scope and history of genetic engineering - molecular tools in genetic engineering: restriction endonucleases, ligases, phosphatases, methylases, and kinases.	13
Unit II	Host cells - vectors- nomenclature - properties of good vector – types of vectors – plasmid (<i>Ti</i> , <i>PBR322</i> & <i>pUC18</i>), bacteriophage (λ phage) - artificial chromosome vectors (BAC & YAC) - transposable elements.	13
Unit III	Gene transfer methods: Natural and Direct – construction of genomic and cDNA libraries – amplification of DNA - polymerase chain reaction (PCR)	13
Unit IV	Selection and screening of rDNA – DNA hybridization – DNA probes - blotting techniques (southern, northern and western blots) - molecular markers (RAPD, RFLP and SNPs).	13
Unit V	*Applications of genetic engineering in Biotechnology- DNA Finger printing technique and its applications – DNA barcoding – Biochip- DNA vaccine - recombinant DNA safety guidelines – Bioethics.	13

**Self study topics*

Powerpoint presentation, Quiz, Seminar, Assignment, Case study on the DNA finger printing technique

Text Books:

1. Dubey R.C., 1995. A text book on Biotechnology (2nd Ed), S. Chand & Company Ltd., New Delhi.
2. Gupta P. K., 2001. Elements of Biotechnology, Rastogi Publications. Meerut.
3. Satyanarayana U., 2005. Biotechnology. Books and Allied (P) Ltd., Kolkata.

Reference Books:

4. Brown T.A., 1995. Gene Cloning- an introduction. Chapman and Hall Publications (3rd Ed).New York.
5. Desmond S.T. Nicholl, 2004. An Introduction to Genetic Engineering (2nd Ed). CambridgeUniversity Press.
6. Freifelder D., 1994.Molecular Biology, NarosaPub. Inc., Boston, London.
7. Freifelder D., 1998. Microbial Genetics. Jones and Barlette Pub. Inc., Boston
8. Glick B.R. and Pastumak, J.J.,1998. Molecular Biotechnology – Principles and application of recombinant DNA (2nd Ed) ASM Press, Washington.
9. Glover D.M., 1980. Genetic Engineering, Cloning DNA, Chapman and Hall, New York.
10. Nicholl Desmond S.T., 2002. An Introduction to Genetic Engineering (Second Edition), CambridgeUniversity Press.
11. Old R.W. and Primrose S.B., 1993. Principles of Gene manipulation an introduction to Genetic engineering, Blackwell Scientific Publications.
12. Primrose S.B. and Twyman R.M., 2008. Gene Manipulation. Blackwell Pub. USA.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	M	H
CO2	M	S	M	M	H
CO3	L	S	M	S	S
CO4	M	S	M	L	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY511	Course Title	2019-2022
		ELECTIVE I - MATHEMATICS FOR BIOLOGISTS	Semester 5
Hrs/Week	5		Credits 5

Course Objective

- To acquire knowledge on basic arithmetic and biostatistical methods
- To introduce the application of computers in Biostatistics

Course Outcome

K1	CO1	To revise the basic arithmetic and number system
K2	CO2	To understand the role of mathematics in solving biological problems
K3	CO3	To introduce the statistical methods for analyzing a data
K4	CO4	To analyse and interpret a sample data using various methods
K5	CO5	To update the computer knowledge in presenting the data

Unit	Content	Hrs
Unit I	Maths in Biology – manipulating numbers – units and conversion – molarities and dilutions – areas and volumes – exponents and logs.	13
Unit II	Matrices – types - addition – subtraction - multiplication – determinants – inverse matrix – solving a system of linear equations.	13
Unit III	Biostatistics – introduction - techniques: <i>Frequency distribution</i> - * collection , analysis and graphical representation of data - measures of central tendency: mean, median and mode - measures of dispersion: range, standard deviation, coefficient of variation and correlation.	13
Unit IV	<i>Theoretical distribution</i> – binomial, poisson and normal distribution – <i>Test of significance</i> - Chi-square test – test for goodness of fit (2x2 contingency table, Yate's correction to be omitted) - Student 't' test – ANOVA (one way classification).	13
Unit V	Softwares for biostatistics – * MS Office - Word & Powerpoint: Excel: spreadsheet – formula bar - standard deviation – correlation – t- test – Chi square test – ANOVA (one way) – charts. Access: Creation and querying the database.	13

Note: Special instruction to question setters: In either or type of questions in sections B and C, one must be a problem and the other will be a question for descriptive answer.

**Self study topics*

Worksheets, Take home assignments, Seminar, Quiz

Text Books:

1. Alexis Leona and Mathews Leon, 1999. Introduction to computers. Leon Tech World, Chennai.

2. Cann Alan J., 2003. Maths from scratch for Biologists. John Wiley & Sons Ltd.,Chichester, England.
3. Gurumani, N., 2005. An introduction to Biostatistics. MJP Publishers, Chennai.

Reference Books:

4. ManicavachagomPillay, T.K., T. Natarajan and K.S. Ganapathy, 2006. Algebra Vol.II. S. Viswanathan (printers & publishers) Pvt Ltd., Chennai.
5. Prasad, S., 2001. Elements of Biostatistics. Rastogi publications, Meerut.
6. Edward Batschlet, 1973. Introduction to mathematics for life sciences. Springer Verlag, New York.
7. Pranab Kumar Banerjee, 2004. Introduction to Biostatistics. S. Chand & Company Ltd., New Delhi.
8. Schwartz J.T.,1961. Introduction to matrices and vectors. McGraw Hill Book Company, INC., New York.
9. Simons S., 1964. Vector analysis for mathematicians, scientists and engineers. Pergamon press, The Macmillan Company, New York.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	H
CO2	H	H	M	M	H
CO3	H	M	L	M	S
CO4	L	M	M	M	S
CO5	M	M	L	H	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. E.Neelamathi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY5S1	Course Title	2019-2022
		SKILL BASED ELECTIVE (MAJOR) – NETWORK AND INFORMATION SECURITY	Semester 5
Hr/Week	1		Credits 2

Course Objective

- To impart knowledge of network security, Wi-Fi security, hackers, secure networking and password managers.

Course Outcome

K1	CO1	To remember the basic concepts of network
K2	CO2	To understand the network hacking techniques
K3	CO3	To deploy information and network security
K4	CO4	To interpret the common threats today in computer network.

Unit	Content	Hrs
Unit I	Basics of network – network media – various operating systems – basics of firewalls on all platforms including Windows, Mac OS and Linux	3
Unit II	Security vulnerabilities across an entire network – network hacking techniques and vulnerability scanning.	3
Unit III	Configure and architect a small network for physical and wireless security- firewall configuration on windows and linux platform. Network privacy issues.	2
Unit IV	Network monitoring to discover and identify potential hackers and malware using tools like WIRESHARK and SYSLOG. Online tracking by hackers.	2
Unit V	Best methods of authentication including passwords, multifactor authentication including soft tokens and hard tokens. Best password managers to use – how passwords are cracked – how to mitigate the password attacks	3

Google classroom

Text Books:

Reference course materials will be available online through NGM open source learning platform.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	S
CO2	H	M	H	H	H
CO3	M	H	M	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. R. Kannan	Dr.R.Kannan	Dr.M.Durairaju	Dr. R. Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY5S2	Course Title	2019-2022
		SKILL BASED ELECTIVE (MAJOR) – CYBER SECURITY – ETHICAL HACKING	Semester 5
Hr/Week	1		Credits 2

Course Objective

- To understand the basics of cyber security, ethical hacking and protection.

Course Outcome

K1	CO1	To remember the basic concepts of cyber security
K2	CO2	To understand the knowledge about ethical hacking
K3	CO3	To deploy the use of hacking tools
K4	CO4	To analyze the details about internet connection.

Unit	Content	Hrs
Unit I	To understand how websites work, how to discover and exploit web application vulnerabilities and to gain full control over websites. Secure systems from all the unknown attacks. Secret tracking and hacking infrastructure.	3
Unit II	Ethical hacking in cyberspace – its fields and different types of hackers. Hack and secure both Wi-fi and wired networks.	3
Unit III	Discover vulnerabilities and exploitation of hacking in cyber network servers. How secure systems are hacked using client-side and social engineering attacks. Use of hacking tools such as Metasploit, Aircrack-ng, SQLmap.. etc.	2
Unit IV	Network basics and how devices interact inside a network-network penetration. Control connections of clients in network by password cracking. Fake Wi-Fi network creation with internet connection and spy on clients. To gather detailed information about clients and networks like their OS, opened ports, etc.	2
Unit V	Explore the threatlandscape – darknets, dark markets, zero day vulnerabilities, exploit kits, malware, phishing and much more. Master defences against phishing, SMSHING, vishing, identity theft, scam, cons and other social engineering threats.	3

Google classroom

Text Books:

Reference course materials will be available online through NGM open source learning platform.

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	M	S	M	H	S
	CO2	H	M	H	M	H
	CO3	M	H	M	M	M
	CO4	M	M	H	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. R, Kannan	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY612	Course Title	2019-2022
		PLANT PHYSIOLOGY	Semester 6
Hrs/Week	5		Credits 4

Course Objective

- To know the cellular functions of plants
- To understand the physiological functions of plants

Course Outcome

K1	CO1	To know the Plant function and Plant movements
K2	CO2	To understand the concept of water potential, water transport
K3	CO3	To analyse the role of photosynthesis and respiration in plant function
K4	CO4	To enlist various plant growth regulators
K5	CO5	To know the stress physiology of plants and

Unit	Content	Hrs
Unit I	Water relations - water potential and its components - *osmosis - absorption of water – absorption of minerals - mineral nutrition.	13
Unit II	Transpiration - significance and factors – Stomatal types – mechanism of stomatal movements - theories of ascent of sap - translocation of solutes - Photosynthesis - light and dark reactions C ₃ - C ₄ pathways - photorespiration.	13
Unit III	Respiration - aerobic - glycolysis - Krebs' cycle – electron transport system (ETS).- anaerobic fermentation - Nitrogen metabolism - nitrogen cycle – biological nitrogen fixation - Biosynthesis of aminoacids.	13
Unit IV	Fat metabolism – fat synthesis – fat degradation – glyoxylate cycle. Plant growth and development - growth regulators - auxins, gibberellins, kinetins,* ethylene and ABA .	13
Unit V	Physiology of flowering - photoperiodism – vernalization – biological clocks –Water and salt stress - Plant movements – seed dormancy - senescence.	13

Powerpoint presentations, Simple Experiments, Demonstrations, Seminar, Quiz, Assignments

Text Books:

1. Verma 1984. Plant physiology. Allied publishers, New Delhi.
2. Jain V.K., 2008. Fundamentals of Plant Physiology. S. Chand & Company Ltd., Ram Nagar, New Delhi.

Reference Books:

3. Bidwell R.G.S., 1982. Plant physiology. Collier Mac Million International edn.
4. Devlin R.M., 1969. Plant Physiology. CBS Publishers & Distributors.
5. Salisbury Frank and L.W. Ross, 1986. Plant physiology. CBS Publishers

6. Srivastava, 1982. Plant physiology, CBS Publishers & Distributors.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	H	L	M
CO2	M	S	H	M	L
CO3	M	S	H	M	H
CO4	M	H	M	M	L
CO5	M	H	L	H	H

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr. R. Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY613	Course Title	2019-2022
		ECONOMIC AND ETHNOBOTANY	Semester 6
Hrs/Week	5		Credits 4

Course Objective

- To acquire knowledge on useful medicinal plants, cultivation methods
- To know the secondary metabolites and therapeutic potentials of plants

Course Outcome

K1	CO1	To revise the traditional system of medicine
K2	CO2	To understand the phytochemistry and medicinal principles of selected plants
K3	CO3	To analyse the distribution, cultivation, extraction and uses of economically important plants
K4	CO4	To prepare herbal formulations
K5	CO5	To create awareness in conserving medicinal plants

Unit	Content	Hrs
Unit I	Economic botany: Importance of plants and plant products- Origin, botanical description, cultivation methods and uses of food plants: Cereals- (rice, wheat), Pulses- (bengal gram, pea), Vegetables- (potato, tomato), Spices- (coriander, ginger), Beverages- (tea, coffee), Rubber and Sugarcane.	13
Unit II	Distribution, method of cultivation, extraction, industrial processing and uses of fibre yielding plants- (Cotton, Jute), Oil yielding plants- (Coconut, Groundnut) - General account and sources of timber and biofuels.	13
Unit III	Ethnobotany: Scope- outline of traditional system of medicine: AYUSH - Ayurveda- Unani- Siddha and Homeopathy. Pharmacognosy, Ethnic groups * Nutraceuticals and bioactive compounds: biological role and applications of alkaloids and glycosides. Medicinal uses of bacteria (Actinomycetes), Algae (<i>Spirulina</i>), Fungi (<i>Penicillium</i>), Pteridophytes (<i>Lycopodium</i>) and Gymnosperms (<i>Ginkgo</i>).	13
Unit IV	Distinguishing features, phytochemistry and medicinal properties of the following plants. Whole plant (<i>Phyllanthus amarus</i>), Roots (<i>Rauwolfia serpentina</i>), Rhizome (<i>Curcuma longa</i>), Leaves (<i>Ocimum sanctum</i>), Flower (<i>Hibiscus rosasinensis</i>), Fruits (<i>Emblica officinalis</i>) and Seeds (<i>Myristica fragrans</i>).	13
Unit V	Herbal formulations - Poultices and compresses. Plant crude drugs- adulteration- types, methods of collection, processing and storage- practices- evaluation of crude drug- * conservation of medicinal plants – sacred groves.	13

*Self study topics

Powerpoint presentation, Demonstration
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Text Books:

1. Wallis T.E., 1985. Text book of Pharmacognosy, 5th edition, CBE publishers and distributors, New Delhi.
2. Ali M., 1997. Text book of Pharmacognosy, CBS publishers and distributors, New Delhi.
3. Kumar N.C., (1993). An Introduction to Medical botany and Pharmacognosy. EmkayPublications, New Delhi.

Reference Books:

4. Gokhale S.B., Kokate C.K., Purohit A.P. 1982. NiraliPrakasham Publisher, Pune.
5. Kirtikar and Basu, 1980. Indian medicinal plants Vol. IV, Panni press, Allahabad.
6. Harborne J.B., 1998. Phytochemical methods – A guide to modern technique of plant analysis, 3rd edn., Chapman & Hall, UK.
7. Wijeskera R.O.B., 1991. The medicinal plant industry, CRC press, Boston, London.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	H	M	M
CO2	L	S	H	H	L
CO3	M	S	H	L	M
CO4	L	H	M	M	L
CO5	M	H	L	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. A. Logamadevi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY614	Course Title	2019-2022
		PLANT BIOTECHNOLOGY	Semester 6
Hrs/Week	5		Credits 4

Course Objective

- To acquire knowledge on plant tissue culture
- To study the role of Biotechnology in food, agriculture and pharmaceutical industries.

Course Outcome

K1	CO1	To list down the sterilization techniques
K2	CO2	To understand the concept of totipotency, micropropagation and haploid production
K3	CO3	To analyse the gene transfer methods
K4	CO4	To know the technicalities in producing transgenic plants

Unit	Content	Hrs
Unit I	Introduction to plant tissue culture – concept of totipotency and pluripotency - sterilization techniques – solid & liquid medium (MS medium, Whites medium) – Micropropagation – stages of micropropagation – applications.	13
Unit II	Callus and cell suspension culture - meristem culture – somatic embryogenesis – principle and applications of somaclonal variation & cryopreservation.	13
Unit III	Haploid production - anther culture – pollen culture – embryo culture and rescue - protoplast isolation, fusion and culture–somatic hybridization – cybrids- *synthetic seeds.	13
Unit IV	Genetic engineering in plants: Direct gene transfer methods - mechanism of T-DNA transfer – <i>Agrobacterium</i> mediated gene transfer – selectable markers – marker assisted gene transfer.	13
Unit V	Production of transgenic plants – disease resistant (<i>Bt</i> cotton) – herbicide resistant (round up soya) – golden rice – <i>Flavr savr</i> tomato – Transgenic plants as bioreactors –Edible vaccines - Plantibodies – Intellectual Property Rights (IPR) - *patenting – importance and types.	13

**Self study topics*

Powerpoint presentations, Group discussion, Seminar, Assignment

Text Books:

1. Chawla H.S., 2000. Introduction to Plant Biotechnology, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
2. Ramawat K.G., 2001. Plant Biotechnology, S. Chand & Company Ltd, New Delhi.
3. Satyanarayana U., 2005. Biotechnology. Books and Allied (P) Ltd., Kolkata.

Reference Books:

4. Street H.E., 1977. Plant tissue culture, Blackwell Scientific Publications, London.
5. Trigiano R.N. and Gray D.J., 1996. Plant tissue culture – concepts and laboratory exercises. CRC Press, New york.
6. Ignacimuthu S., 1996. Applied Plant Biotechnology, TataMcGraw Hill Publishing Company Ltd, New Delhi.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	H	H	M
CO2	M	H	M	M	H
CO3	M	L	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY615	Course Title	2019-2022
		ELECTIVE – II – BIOINFORMATICS	Semester 6
Hrs/Week	5		Credits 5

Course Objective

- To introduce classical bioinformatics theory to students
- To focus computer science techniques used in biological studies

Course Outcome

K1	CO1	To introduce the biological databases and computer languages
K2	CO2	To understand the sequence analysis techniques
K3	CO3	To analyse the structure of proteins with the help of computers
K4	CO4	To comprehend genomics and proteomics
K5	CO5	To know the role of computers in drug discovery

Unit	Content	Hrs
Unit I	Introduction to computers - components of computers – input devices – output devices - storage devices - operating system - DOS/WINDOWS/LINUX - computer languages - machine language – assembly language - high level languages - translators – compilers.	13
Unit II	Computer languages for bioinformatics - HTML – structure – tags – formatting – hyperlink – graphics; C language – history – features of C – structure of C program – character set – key words – data types – constants, variables – statements – functions.	13
Unit III	Introduction to internet - data communication concept – LAN / WAN / WWW – e-mail & FTP - Bioinformatics - definition - biological database (generalized & specialized) - nucleic acid database - protein database - genome database - bibliographic resources and literature database - bioinformatics servers.	13
Unit IV	Searching techniques – ENTREZ - sequence analysis tools - sequence alignment - pairwise alignment (BLAST) – multiple sequence alignment (CLUSTAL X) - phylogenetic analysis – tree building and tree analysis.	13
Unit V	Protein prediction - primary structure prediction - secondary structure prediction – bio molecular visualization (RASMOL) – drug discovery - target and lead discovery - Computer Aided Drug designing (CAD).	13

**Self study topics*

Powerpoint presentation, Seminar, Assignment
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Text Books:

1. Lesk A.M., 2002, Introduction to Bioinformatics, Oxford University Press, Oxford.
2. Parthasarathy S., 2008. Essentials of programming in C for life sciences. Ane Books India, New Delhi.
3. Sundararajan S. and R. Balaji, 2002 Introduction to Bioinformatics, Himalaya Publishing House – Mumbai.

Reference Books:

4. Chakraborty C., 2004, Bioinformatics Approaches and Application. Chawla offset printers – Delhi.
5. Westhead D.R., J. Parish and R.M.Twyman, 2003. Bioinformatics (instant notes) Viva books private limited – New Delhi.
6. Khan I.A. and A. Khanum, 2002, Emerging trends in Bioinformatics, Ukaaz Publications.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	M	H
CO2	H	H	M	M	H
CO3	H	H	M	H	H
CO4	M	H	H	H	H
CO5	L	M	H	L	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr.E.Neelamathi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY616	Course Title	2019-2022
		ELECTIVE – III – HABITAT ECOLOGY	Semester 6
Hrs/Week	5		Credits 5

Course Objective

- To know the uniqueness of the varying habitats in the biosphere
- To acquire the knowledge about the structure and functions of different ecosystems
- To learn the techniques for environmental assessment and ecological dynamics.

Course Outcome

K1	CO1	To appreciate the various habitats and their vegetation
K2	CO2	To understand the concept of habitats and succession
K3	CO3	To analyse the components of different ecosystems
K4	CO4	To know-how the methods of Environmental audits and Environmental Impact Assessment
K5	CO5	To inventor and manage the natural resources using Remote sensing techniques.

Unit	Content	Hrs
Unit I	Introduction to habitat ecology: historical, ecological & evolutionary perspectives - habitat concepts (edge, ecotones, interspersion and juxtaposition) - units of vegetation – *succession.	13
Unit II	Ecology of major habitats: forest (tropical rain forest, deciduous and coniferous) – scrub jungle and deserts (hot, dry and cold deserts) – grasslands (temperate and tropical).	13
Unit III	Ecology of major habitats: aquatic (fresh water - lentic & lotic) – marine (coasts, estuaries, phytoplankton and phytobenthos, mangroves and coral reefs.) – tundra (arctic and alpine).	13
Unit IV	Physical and anthropogenic factors influencing habitats - habitat degradation and fragmentation - Environmental Impact Assessment (EIA) - environmental audits - *Environmental Legislations and Regulations.	13
Unit V	Inventory of unique habitats and their distribution - Remote Sensing (RS) - Geographical Information System (GIS) –Indian Regional Navigation Satellite System (IRNSS)- principles and applications of remote sensing techniques - cover classification and mapping - use and values of GIS approaches to habitat ecology.	13

**Self study topics*

Field study, Inventory of Campus vegetation, Powerpoint presentations, Seminar, Assignment
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Text Books:

1. Odum E.P.(ed), 1971. Fundamentals of Ecology, W.B. Saunders Company, Philadelphia.
2. Sharma P.D., 1997. Ecology and Environment, Rastogi Publications, Meerut.
3. Dash M.C., 1993. Fundamentals of Ecology, Tata McGraw Hill, New Delhi.
4. Agarwal K.C., 1989. Environmental Biology, Agro Botanical Publishers (India), Delhi.
5. Ananthkrishnan T.N., 1987. Bioresources Ecology, Oxford and IBH, New Delhi.
6. Kormondy E.J., 1999. Concepts of Ecology, Prentice Hall, New Delhi.

Reference Books:

7. Leonard Ortolano, 1997. Environmental Regulation and impact Assessment. John Wiley & Sons, Inc.
8. Cadogan A. and G. Best, 1992. Environment and Ecology, Nelson Blackie, Glasgow.
9. Lenihan J. and W.W. Fletcher, 1977. Environment and Man, Vol IV. The Chemical Environment, Blackie, London.
10. Pandian T.J., 2000. Biodiversity: Status and Endeavours of India, UNESCO sponsored international workshop on Biodiversity, Ghent University, Belgium, pp. 3-6
11. Subrahmanyam N.S., and Sambamurthy, A.V.S., 2001. Ecology, Narosa Publishing House, New Delhi.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	M	H	M	L	M
CO3	H	H	S	M	M
CO4	M	M	H	L	S
CO5	S	H	S	S	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr.R.Kannan	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY617	Course Title	2019-2022
		MAJOR PRACTICAL - III (for V sem theory papers)	Semester 6
Hrs/Week	2		Credits 4

Course Objective

- To learn the plant systematics and herbarium techniques
- To study the physiological processes in the plant system
- To acquire practical knowledge on plant tissue culture and genetic engineering

Course Outcome

K1	CO1	To appreciate the diversity of flowering plants and their identification in their natural habit
K2	CO2	To get hands-on training in culturing bacteria
K3	CO3	To identify economically important plant diseases
K4	CO4	To solve biological problems using mathematics
K5	CO5	To create interest in learning the applications of Genetic Engineering
K6	CO6	To obtain working knowledge in creating a word document, powerpoint, excel

Unit	Content	Hrs
Unit I	<p>Taxonomy of Angiosperms Detailed study, description of floral parts of the plant families included in theory paper. Field trip, collection of plants and submission of herbarium 20 sheets.</p> <p>Genetics and Evolution: Solving problems on Mendelian inheritance and interaction of genes; charts and diagrams from genetics and evolution.</p>	6
Unit II	<p>Microbiology: Demonstrations:</p> <ol style="list-style-type: none"> 1. Microscopy 2. Culture media preparation 3. Pure culture techniques (streak, pour and spread plate) 4. Antibiotic assay <p>Individual experiments</p> <ol style="list-style-type: none"> 1. Smear preparation 2. Simple staining 3. Differential staining 4. Hanging drop experiment <p>Charts: Ultra structure of bacterium, HIV, rabies, T₄ phage, antigen and antibody and food and industrial microbiology related charts.</p> <p>Plant pathology Specimens/charts/ of diseases:</p> <ol style="list-style-type: none"> 1. Citrus canker 2. Red rot of sugar cane 3. Tikka disease of ground nut 4. Paddy blast 	5

	5. TMV	
Unit III	Genetic Engineering: Charts/spotters on Genetic Engineering Mathematics for Biologists: Simple problems on 1. Manipulating numbers 2. Units and conversion 3. Molarities and dilutions 4. Areas and volumes 5. Exponents and logs 6. Matrices and determinants.	5
Unit IV	Bio- Statistics: 1. Collection, analysis and graphical representation of data 2. Measures of central tendency - mean, median and mode 3. Measures of dispersion: range, standard deviation, coefficient of variation correlation 4. Test of significance - Chi-square test and Student‘t’ test.	5
Unit V	Application of software in Biostatistics: 1. Simple exercises in MS- Word 2. Presentation in MS-Powerpoint 3. Statistical calculations and chart preparation in MS-Excel 4. Creation of database in MS-Access.	5

Identification of plants, Demonstrations, culture techniques

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	H	H	H
CO2	M	M	H	M	H
CO3	H	M	H	M	M
CO4	H	M	H	L	S
CO5	M	M	M	M	S
CO6	H	M	H	L	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumar
Dr. E.Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY618	Course Title	2019-2022
		MAJOR PRACTICAL - IV (for VI sem theory papers)	Semester 6
Hrs/Week	2		Credits 4

Course Objective

- To acquire basic knowledge in mathematics & biostatistics
- To create programs for bioinformatics
- To understand bioinformatics tools

Course Outcome

K1	CO1	To compare the physiological functions of plants under different environmental conditions
K2	CO2	To know the economically important plants and their produces
K3	CO3	To create interest in rearing plants <i>in vitro</i>
K4	CO4	To learn the bioinformatics tools to analyse the protein structure
K5	CO5	To study the vegetation using Quadrat and line transect method

Unit	Content	Hrs
Unit I	Plant physiology Individual experiments: <ol style="list-style-type: none"> 1. Estimation of water potential (DPD) by liquid immersion method and plasmolytic method. 2. Estimation of osmotic pressure by plasmolysis. 3. Determination of respiration by respiroscope 4. Determination of stomatal frequency and index. 5. Determination of rate of transpiration - Cobalt chloride, Ganongs potometer. 6. Determination of rate of photosynthesis under different CO₂ concentrations & different light intensities using wilmots bubbler 	6
Unit II	Plant physiology demonstration experiments: <ol style="list-style-type: none"> 1. Light screen experiment 2. Amylase activity 3. Soil nitrification 4. Determination of respiratory quotient 5. Essentiality of mineral elements on plant growth – Hydroponics Economic & Ethnobotany <ol style="list-style-type: none"> 1. Economic importance of fibre yielding plants, oil yielding plants, pulses, cereals, spices and condiments. 2. Charts and specimens of ethnobotanical significance. 	5
Unit III	Plant Biotechnology Charts/spotters on Plant biotechnology and transgenic plants Demonstration <ol style="list-style-type: none"> 1. Media for plant tissue culture 2. Callus induction 	5

	3. Regeneration of plantlet 4. Synthetic seeds	
Unit IV	Bioinformatics 1. Programming using HTML 2. Designing and editing of web page 3. Writing programs using C. 4. Searching and retrieval of biological database. 5. Bibliographic searching using ENTREZ 6. Sequence alignment 7. Gene finding 8. Protein prediction 9. Molecular visualization	5
Unit V	Habitat Ecology 1. Vegetation study by Quadrat and Line transect method 2. Estimation of plant biomass 3. Determination of dissolved oxygen 4. Estimation of CO ₂ in selected water samples 5. Determination of Total Dissolved Solids 6. Spotters and charts on Habitat ecology.	5

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	H	M	M
CO2	M	M	M	H	M
CO3	M	M	H	M	M
CO4	M	M	M	S	H
CO5	S	H	S	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. R. Kannan	Dr. R. Kannan	Dr.M.Durairaju	Dr.R.Muthukumaran
Dr. M. Latha Isabel			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY6S3	Course Title	2019-2022
		SKILL BASED ELECTIVE (MAJOR) – HORTICULTURE AND PLANT BREEDING	Semester 6
Hr/Week	1		Credits 2

Course Objective

- To study the basic principles of horticulture
- To learn the techniques of plant propagation
- To know the methods and practices in plant breeding

Course Outcome

K1	CO1	To know the methods of vegetative propagation
K2	CO2	To understand the principle behind plant propagation
K3	CO3	To propagate plants using simple horticultural techniques
K4	CO4	To develop interest in flower arrangement, fruit preservation and vegetables

Unit	Content	Hrs
Unit I	Scope – methods of vegetative propagation – cutting – layering – grafting – manures – fertilizers – irrigation.	3
Unit II	Gardening – important ornamentals – habits and types – types of garden – Terrace garden – public garden – garden components – lawn – glass house – rockery – water garden - topiary.	3
Unit III	Production technology – plant protection measures for horticultural crops – cultivation of vegetables (Brinjal) – flowers (Jasmine)	2
Unit IV	Commercial horticulture – papain – bonsai – flower arrangement – cut flowers – preservation of fruits and vegetables.	2
Unit V	Plant breeding – objectives – plant selection – plant introduction – hybridization – achievements in crop breeding – Paddy.	3

Charts, Powerpoint presentation, Demonstration

Text Books:

1. Mani BhusanRao, 1964. Text book of Horticulture. Macmillan India Ltd., Newdelhi.
2. Sharon Pastor *et al.*, 2010. Basics of Horticulture, Oxford Book Company, Jaipur.
3. Singh P., 1996. Plant Breeding. Kalyani publishers, NewDelhi.

Reference Books:

4. Kumar N., 1993. An introduction to horticulture, TNAU, Coimbatore.
5. George Acquaah, 2004. Horticulture – principles and practices. Prentice Hall of India Pvt Ltd., New Delhi.
6. Edmond, 1988. Fundamentals of Horticulture. MCGH Publications New Delhi.
7. Shukla R.S. and P.S. Chandal, 1998. Cytogenetics Evolution and Plant Breeding. Chand & Company Ltd. NewDelhi.
8. Satya P. 2012. Plant Breeding. Books and allied Pvt Ltd. Kolkatta.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	M	S	M
CO2	M	H	H	M	M
CO3	M	H	S	M	M
CO4	H	M	S	S	S

S-Strong; H-High; M-Medium; L-Low

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	19UBY6S4	Course Title	2019-2022
		SKILL BASED ELECTIVE (MAJOR) – MUSHROOM CULTIVATION	Semester 6
Hr/Week	1		Credits 2

Course Objective

- To acquire knowledge on the mushroom culture

Course Outcome

K1	CO1	To identify edible mushrooms from poisonous ones
K2	CO2	To understand the mushroom cultivation
K3	CO3	To know-how the mushroom culture techniques
K4	CO4	To create interest in preparing mushroom recipes

Unit	Content	Hrs
Unit I	Introduction to mushroom cultivation: General characters, structure and reproduction of mushrooms – Identification of mushrooms-types of mushroom- Poisonous mushroom.	2
Unit II	Uses of mushroom: Nutritive and food value, Medicinal value	2
Unit III	Mushroom culture techniques: Mushroom shed construction-spawn preparation - medium preparation -spawn running - incubation. Cultivation methods for Button & Oyster mushrooms - disease and control measures.	3
Unit IV	Post harvest operations: Harvesting – storage and preservation – spoilage of mushrooms - packing – marketing.	3
Unit V	Mushroom recipes: Mushroom soup, sandwich, gravy, omelette, mushroom chilly, manchurian and briyani.	2

Powerpoint presentation, Demonstration,

Text Books:

- Nita bahl, 1988. Hand book of mushrooms, Vol. II, IBH publishers.
- Kannian, 1980. Text book of Mushroom, Today and Tomorrow publishers, Chennai.

Reference Books:

- Pathak V.N., Yadav N. and Gour M., 2000. Mushroom production and processing technology, Agrobios (India) Ltd.
- Chang S.T. and N.A.Hayer, 2002. The biology and cultivation of edible mushrooms.
- Reeti Singh and U.C. Singh, 2005. Modern Mushroom cultivation, Agrobios (India) Ltd.

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M
CO2	M	H	L	S	M
CO3	M	H	S	S	M
CO4	M	H	S	S	M

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Dr. E. Neelamathi	Dr.R.Kannan	Dr.M.Durairaju	Dr.R.Muthukumarar