DEPARTMENT OF BOTANY

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE (AUTONOMOUS)

POLLACHI – 642 001

SYLLABUS

CBCS & OUTCOME BASED EDUCATION

For the students admitted during 2021 - 2024

B.Sc., BOTANY

&

ALLIED ZOOLOGY

REVISED ON THE BOARD OF STUDIES

HELD ON MAY 2021

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.

Program Educational Objectives:

PEO1	To groom the studentadmitted in the under graduate Botany Program into a socially responsible citizen.
PEO2	To impart quality education to meet the demands of higher education and research in Botany
PEO3	To instill confidence by sharpening their leadership skills and soft skills among the graduate students
PEO4	To develop a competitive edge among the students by encouraging to take up various courses
PEO5	To inculcate the habit of excellence in the students so as to produce sound professionals in the field of Botany

PROGRAMME SPECIFIC OUTCOMES

On successful completion of the B.Sc. Botany Degree Programme, the graduates are expected to achieve the following outcomes within five to seven years.

PSO – 01	To transform the student into a confident individual with academic knowledge blended with leadership skills
PSO – 02	To instill confidence in the knowledge obtained in the avenues of Plant Biology in pursuing higher education or taking up appropriate jobs.

PROGRAMME OUTCOMES

After learning B. Sc. Botany Programme, our students are enable to

PO1	To appreciate, understand and conserve the biodiversity of cellular forms, lower plants to higher plants
PO2	To enhance the theoretical knowledge and basic concepts on Biomolecules, Microbes, Plant Structure, Function, Evolution and Environment
PO3	To develop practical knowledge in the preparation of microsections, herbarium, quantifying biomolecules and other basic techniques.
PO4	To attain entrepreneurial skills in the fields of Horticultural techniques, Landscape designing, Herbal cosmetics, Biofertilizers, Mushroom cultivation, Organic farming
PO5	To update the students with modern trends in Plant biology and introduce the interdisciplinary approach
PO6	To inculcate the habit of reading dailies, research articles and publications so as to groom the students in communicating scientific reports and dissertations.
PO7	To educate the students with professional ethics so as to enable them into a complete professional.
PO8	To encourage the students to identify the various career options (Research & Higher studies/Competitive Exams/Consultants/Teaching/Forest Department officials/Entrepreneurs/Field Botanists/ Herbarium Technicians etc.)

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE, POLLACHI.

DEPARTMENT OF BOTANY
B.Sc., BOTANY
SCHEME OF EXAMINATION (I -VI SEMESTER)
(FOR CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2021-2024)

(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	21UTL101 / 21UHN101 / 21UFR101	Tamil/Hindi/French Paper – I	6	3	50	50	100	3
II	21UEN101	English Paper – I	5	3	50	50	100	3
III	21UBY101	Major Paper I - Plant Diversity I (Phycology, Mycology and Bryology)	6	3	50	50	100	4
	21UBY203	Major Practical I – Paper III (Plant diversity I & II (Phycology, Mycology and Bryology & Pteridophytes Gymnosperms and Palaeobotany)	3	-	-	-	-	-
	21UBY1A1	Allied - Paper I - Zoology	5	3	50	50	100	3
	21UBY2A3	Allied - Paper III Practical	2	-	-	-	-	-
IV	21UHR101	Human Rights	1	2	-	50	50	2
	21HEC101	Human Excellence - Personal values & SKY yoga practice–I	1	2	25	25	50	1
V		Extension Activities (Annexure –I)	-	-	-	-	-	-
	21CFE101	Fluency in English - I	-	-	-	-	-	-
CC		Online Course (Optional) (MOOC/NPTEL/SWAYAM)						Grade
							500	**16**
	Semester II							
I	21UTL202/ 21UHN202/ 21UFR202	Tamil/ Hindi/ FrenchPaper – II	6	3	50	50	100	3
II	21UEN202	English Paper – II	5	3	50	50	100	3
III	21UBY202	Major Paper II Plant Diversity II (Pteridophytes, Gymnosperms and Palaeobotany)	6	3	50	50	100	4
	21UBY203	Major Practical I – Paper III (Plant diversity I & II (Phycology, Mycology and Bryology & Pteridophytes	2	3	50	50	100	4

		Gymnosperms and Palaeobotany)						
	21UBY2A2	Allied - Paper II Zoology	6	3	50	50	100	3
	21UBY2A3	Allied - Paper III Practical	3	3	50	50	100	4
IV	21EVS201	Environmental Studies	2	2	-	50	50	2
	21HEC202	Human Excellence - Family values & SKY yoga practice- II	1	2	25	25	50	1
V		Extension Activities (Annexure –I)	-	-	-	-	-	-
CC	21CFE202	Fluency in English - II	-	-	-	-	-	-
	21CMM201	Manaiyiyal Mahathuvam - I	1	2	-	50	50	Grade
	21CUB201	Uzhavu Bharatham - I	1	2	-	50	50	Grade
		Online Course (Optional) (MOOC/NPTEL/SWAYAM)						Grade
	700 24							
	Semester III							
I	21UTL303/ 21UHN303/ 21UFR303	Tamil/ Hindi/ French Paper – III	5	3	50	50	100	3
II	21UEN303	English Paper – III	6	3	50	50	100	3
III	21UBY304	Major Paper IV- Anatomy and Embryology	6	3	50	50	100	4
	21UBY406	Major Practical II - Paper VI (Anatomy & Embryology, Cell Biology, Biochemistry and Biophysics)	3	-	-	-	-	-
	21UBY3A4	Allied Paper IV - Chemistry	6	3	50	50	100	3
	21UBY4A6	Allied paper VI – Chemistry Practical	2	-	-	-	-	-
IV	21UBY3N1/ 21UBY3N2	Skill based subjects (Non major electives)- Landscape designing/ Herbal cosmetics *Basic Tamil paper I	1	2	-	50	50	2
	21HEC303	Human Excellence - Professional values & SKY yoga practice- III	1	2	25	25	50	1
V		Extension Activities (Annexure –I)	-	-	-	-	-	-
CC	21CFE303	Fluency in English - III	-	-	-	-	-	-
	21CMM302	Manaiyiyal Mahathuvam – II	1	2	-	50	50	Grade
	21CUB302	Uzhavu Bharatham - II	1	2	-	50	50	Grade
	500 16							
	Semester IV							
I	21UTL404/ 21UHN404/ 21UFR404	Tamil/ Hindi/ French Paper – IV	5	3	50	50	100	3
II	21UEN404	English Paper – IV	6	3	50	50	100	3
III	21UBY405	Major Paper V – Cell Biology, Biochemistry and Biophysics	6	3	50	50	100	4

	21UBY406	Major Practical II - Paper VI (Anatomy & Embryology, Cell Biology, Biochemistry and Biophysics)	2	3	50	50	100	4
	21UBY4A5	Allied - Paper V- Chemistry	6	3	50	50	100	3
	21UBY4A6	Allied paper VI – Chemistry Practical	3	3	50	50	100	4
IV	21UBY4N3/ 21UBY4N4	Skill based subjects (Non major electives)- (Remote sensing and natural resource management/ Bioinformatics) *Basic Tamil paper II	1	2	-	50	50	2
	21HEC404	Human Excellence – Social values & SKY yoga practice- IV	1	2	25	25	50	1
V		Extension Activities (Annexure –I)			50		50	1
CC	21CFE404	Fluency in English - IV	-	-	-	-	-	-
	21CMM403	Manaiyiyal Mahathuvam - III	1	2	-	50	50	Grade
	21CUB403	Uzhavu Bharatham - III	1	2	-	50	50	Grade
							750	**25**
	Semester V							
III	21UBY507	Major Paper – VII - Taxonomy of Angiosperms	5	3	50	50	100	4
	21UBY508	Major Paper VIII - Genetics and Evolution	5	3	50	50	100	4
	21UBY509	Major Paper IX – Bioinformatics	5	3	50	50	100	4
	21UBY510	Major Paper X – Mathematics for Biologists	5	3	50	50	100	4
	21UBY5E1/ 21UBY5E2/ 21UBY5E3	Elective I – Microbiology and Plant pathology Elective I–Ethno Botany Elective I –Herbal cosmetics and Cosmeceuticals	5	3	50	50	100	5
	21UBY614	Major Practical III – Paper XV (for V Sem theory papers)	3	-	-	-	-	-
	21UBY5AL	Advanced Learner Course - I Biological Disaster – Mitigation &Management	SS	3	50	50	100	4#
	21UBY5VA	Value Added Course - Organic farming (Optional)	15hrs/sem					1#
IV	21UBY5S1/ 21UBY5S2	Skill Based Electives I- Network and Information security/ Cyber Security- Ethical Hacking	1	2	-	50	50	2
	21GKL501	General Knowledge & General Awareness (SBE)	SS	2	-	50	50	2
	21HEC505	Human Excellence - National values & SKY yoga practice- V	1	2	25	25	50	1
CC	21CFE505	Fluency in English - V	-	-	-	-	-	-
	21CSD501	Soft Skill Development - I	-	-	-	-	-	Grade

							650	**26**
	Semester VI							
III	21UBY611	Major Paper XII – Plant Physiology	5	3	50	50	100	4
	21UBY612	Major Paper XIII – Biotechnology & Genetic Engineering	5	3	50	50	100	4
	21UBY613	Major Paper XIV - Horticulture & Plant Breeding	4	3	50	50	100	4
	21UBY6E4/ 21UBY6E5/ 21UBY6E6	Elective II – Habitat Ecology Elective II – Biodiversity and its Conservation Elective II – Environmental Biotechnology	5	3	50	50	100	5
	21UBY6E7/ 21UBY6E8/ 21UBY6E9	Elective III – Bioprospecting Elective III – Biofertilizers Elective III – Seed Technology	5	3	50	50	100	5
	21UBY614	Major Practical III – Paper XV (for V Sem theory papers)	2	3	50	50	100	4
	21UBY615	Major Practical IV (for VI Sem theory papers)	2	3	50	50	100	4
	21UBY6AL	Advanced Learner Course II - Bionanotechnology	SS	3	50	50	100	4#
	21UBY6VA	Value Added Course – Coconut farming (Optional)	15hrs/sem					1#
IV	21UBY6S3 21UBY6S4	Skill Based Elective II – Forest Botany Skill based Elective II – Mushroom cultivation	1	2	-	50	50	2
	21HEC606	Human Excellence - Global values & SKY yoga practice- VI	1		25	25	50	1
CC	21CFE606	Fluency in English - VI	-	-	-	-	-	-
	21CSD602	Soft Skill Development - II	-	-	-	-	-	Grade
							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

AL – Advanced Learner Course (Optional); VA- Value Added Course

CC- Certificate Course/Co-Scholastic Course

Extra credits

Question Paper Pattern
(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 70 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define/Short Answer)	10 x 1 = 10	MCQ Define	70 **(Reduced to 50 for ESE)**
K3 (Q 11-15)	B (Either or pattern)	5 x 4 = 20	Short Answers	
K4 & K5 (Q 16 – 21)	C (Q -16 is Compulsory and Q 17 – 21 answer any 3)	4 x 10 = 40	Descriptive/ Detailed	

2. Theory Examinations: 50 Marks

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define / Short Answer)	10 x 1 = 10	MCQ Define	50 **(Reduced to 25 for ESE)**
K3, K4 & K5 (Q 11-18)	B (Answer 5 out of 8)	5 x 8 = 40	Short Answers	

3. Practical Examinations: 100/50 Marks

Knowledge Level	Criterion	External/Internal Marks	Total
K3	Record work & Practical	50/50	100
K4			
K5		25/25	50

***** In Theory ESE, Students will write Examination Maximum Marks as 70 and it will be reduced to 50 for Total Mark calculation.

COMPONENTS OF CONTINUOUS ASSESSMENT

THEORY

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test 1	(70 / 4.67) = 15	15+15+10+05+05	50
Test 2 / Model	(70 / 4.67) = 15		
Assignment / Digital Assignment	10		
Seminar / Socratic Seminar	05		
Group Task : GD, Role Play, APS	05		

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	10	10+5+5+5	25
Assignment / Digital Assignment	5		
Seminar / Socratic Seminar	5		
Group Task : GD, Role Play, APS	5		

PRACTICAL

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test / Model	30	30+5+15	50
Observation Note	5		
Record	15		

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	15	15+5+5	25
Observation Note	5		
Record	5		

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

D	C	B	A
01 - 05	06 - 10	11 - 15	16 - 20

CRITERIA	D - Inadequate	C - Average	B - Admirable	A - Outstanding	Score
Organization of presentation	Hard to follow; sequence of information jumpy	Most of information presented in sequence	Information presented in logical sequence; easy to follow	Information presented as interesting story in logical, easy to follow sequence	
Knowledge of subject & References	Does not have grasp of information; answered only rudimentary Questions **&** Material not clearly related to topic **OR** background dominated seminar	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	
Presentation Skills using ICT Tools	Uses graphics that rarely support text and presentation	Uses graphics that relate to text and presentation	Uses graphics that explain text and presentation	Uses graphics that explain and reinforce text and presentation	
Eye Contact	Reads most slides; no or just occasional eye contact	Refers to slides to make points; occasional eye contact	Refers to slides to make points; eye contact majority of time	Refers to slides to make points; engaged with audience	
Elocution - not ability to speak English language	Mumbles and/or Incorrectly pronounces some terms Voice is low; difficult to hear	Incorrectly pronounces some terms Voice fluctuates from low to clear; difficult to hear at times	Incorrectly pronounces few terms Voice is clear with few fluctuations; audience can hear well most of the time	Correct, precise pronunciation of all terms Voice is clear and steady; audience can hear well at all times	

WRITTENASSIGNMENTGRADINGRUBRIC

Grading Scale:

F	D	C	B	A
01 - 04	05 - 08	09 - 12	13 - 16	17 - 20

CRITERION	A - Excellent	B - Good	C - OK	D - Below Standard	F - Missing
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and writing is interesting	Hits in basic content and writing is understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	∗ Word choice is rich and varies ∗ Writing style is consistently strong ∗ Students own formal language	∗ Word choice is clear and reasonably precise ∗ Writing language is appropriate to topic ∗ Words convey intended message	∗ Word choice is basic ∗ Most writing language is appropriate to topic ∗ Informal language	∗ Word choice is vague ∗ Writing language is not appropriate to topic ∗ Message is unclear	∗ Did not include
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Did not include
Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timeliness	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Did not include

SYLLABUS

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY101	Course Title	2021-2024
		PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY AND BRYOLOGY)	Semester 1
Hrs/Week: 6			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
- To learn the evolutionary trends in the lower plants

Course Learning Outcome

After successful completion of this course, the student should be able to

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
K5	CO5	To appreciate the progressive evolution observed in the lower plant group

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	M	M	M	H	H	H	H	H
CO2	H	H	M	M	M	H	H	H	H	H
CO3	H	H	M	M	M	H	H	H	H	H
CO4	H	H	H	L	-	H	H	H	H	H
CO5	H	H	H	M	-	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	General characters of algae - Classification of algae (Fritsch) – Distribution, structure, reproduction and life cycle of the following: Cyanophyceae (*Nostoc*), Chlorophyceae (*Oedogonium*, *Chara*) and Phaeophyceae (*Sargassum*).	**18**
Unit II	Distribution, structure, reproduction and life cycle of the following: Rhodophyceae (*Polysiphonia*) and Bacillariophyceae (*Cyclotella* &*Pinnularia*) - ***Economic importance of algae**.	**18**
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- *Mucor*, Ascomycetes – *Penicillium*, Yeasts	**18**
Unit IV	Structure, reproduction and life cycle of Basidiomycetes - *Puccinia*. Lichens: Occurrence, Morphology, structure, Reproduction and Economic importance.	**18**
Unit V	General characters and classification of Bryophytes (Reimers), Distribution, structure, development and reproduction of *Riccia, Anthoceros* and *Polytrichum.*	**18**

**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 Thallophytes. 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. 3rd Edn. 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.

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. A. Logamadevi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (Zoology)	
Course code 21UZY1A1		Course Title		2021-2024
		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 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 of angiosperms
K3	CO3	To know the embryo development and fertilization in higher plants
K4	CO4	To analyze the economically important plant diseases and their control measures
K5	CO5	To obtain the skill of technically draw the plant tissues

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	L	H	H	H	H	H
CO2	H	H	H	M	L	H	H	H	H	H
CO3	H	H	H	M	M	H	H	H	H	H
CO4	H	H	H	-	-	H	H	H	H	H
CO5	H	H	H	-	-	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Structure, life history and ***economic importance** of the following types: Algae: *Oedogonium*, Diatoms and *Polysiphonia*, Fungi: *Penicillium* and *Agaricus*, Lichens.	**16**
Unit II	A brief account of the structure, reproduction and life cycle of the following genera (excluding development of sex organs): Bryophyte: *Riccia*, Pteridophyte: *Lycopodium* and Gymnosperm: *Cycas*.	**16**
Unit III	Simple permanent tissues – parenchyma, collenchyma and sclerenchyma - complex tissues – xylem and phloem - cambium – Primary structure of dicot stem (*Tridax*), monocot stem (*Sorghum*), dicot root (Bean), monocot root (*Zea mays*), Internal structure of dorsiventral and isobilateral leaf. Normal secondary thickening in dicot stems (*Polyalthia*).	**15**
Unit IV	Anther structure – Microsporogenesis – male gametophyte – ovule	**15**

	structure – megasporogenesis - 8 nucleate embryo sac – double fertilization and triple fusion – endosperm (nuclear and cellular) – structure of dicot and monocot embryos (development excluded) – polyembryony - parthenocarpy.	
Unit V	Plant diseases – classification – host – pathogen types and interaction – disease cycle – symptoms - viral disease (TMV) - bacterial disease (citrus canker) - fungal disease (red rot of sugarcane) – ***Plantdisease 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.

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code 21UBY202		Course Title		2021-2024
		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 Paleobotany
- To revisit the geological time scale with respect to the plant group

Course Outcome

K1	CO1	To appreciate the morphology and lifecycle of Pteridophytes and Gymnosperms
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 study the fossil plants and their fructifications
K5	CO5	To compare the evolutionary trends that exist in anatomical and reproductive structures in Pteridophytes and Gymnosperms

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	L	-	H	H	H	H	H
CO2	H	H	M	L	-	H	H	H	H	H
CO3	H	H	H	-	-	H	H	H	H	H
CO4	H	H	M	-	L	H	H	H	H	H
CO5	H	H	M	-	L	H	H	H	H	H

H-High; M-Medium; L-Low

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 (*Psilotum*)and Lycopsida *(Lycopodium)*	**13**
Unit II	Structure, development and reproduction of Ligulopsida (Selaginella) and Filicopsida (Gleichenia*)*.***Economic importance of Pteridophytes**.	**13**
Unit III	**Gymnosperms:** General characters and classification of Gymnosperms (Sporne, 1965) – structure, development and reproduction of *Cycas*.	**13**

Unit IV	Structure development and reproduction of *Gnetum* – affinities of *Gnetum* with Angiosperms *__Economic importance of Gymnosperms__.	**13**
Unit V	**Palaeobotany:** Geological time scale – fossils –18ossilization– kinds of fossils – detailed study of *Rhynia,Lyginopteris*, *Lepidodendron*, *Lepidocarpon*, *Lepidostrobus* and *Williamsonia*.	**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. 3rd Edn. 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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. A. Logamadevi	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. K.Rajalakshmi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY203	Course Title	2021-2024
		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 understand the internal structures and spore bearing parts of selected lower plant forms
K3	CO3	To prepare micro sections and to identify fossil specimen and slides
K4	CO4	To compare the life cycles of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms
K5	CO5	To professionally draw plant sketches

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	0PO 8	PSO1	PSO2
CO1	H	H	H	M	-	H	H	H	H	H
CO2	H	H	H	M	M	H	H	H	H	H
CO3	H	M	H	M	M	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H	H
CO5	H	H	H	-	-	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	A detailed study of thallus organization and reproductive structures of the following forms: **Algae –** *Nostoc, Oedogonium, Chara, Sargassum, Polysiphonia, Cyclotella* and *Pinnularia*. **Fungi -** *Mucor*, *Penicillium*,Yeast and *Puccinia.* **Lichen –***Usnea.*	**5**
Unit II	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: **Bryophytes** -*Riccia, Anthoceros*and *Polytrichum.*	**5**
Unit III	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: **Pteridophytes** – *Psilotum, Lycopodium, Selaginella and Gleichenia.*	**5**

Unit IV	A detailed study of morphology, anatomy and structure of vegetative & spore bearing parts of the following genera: **Gymnosperms** - *Cycas* and *Gnetum.*	**6**
Unit V	A detailed study of the following fossil genera *Rhynia, Lyginopteris, Lepidodendron, Lepidocarpon, Lepidostrobus* and *Williamsonia* from fossil specimen/parts or slides.	**6**

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

Compiled by **Name with Signature**	**Verified by HOD** **Name with Signature**	**CDC**	**COE**
Dr. M. Latha Isabel Dr. A. Logamadevi	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (Zoology)
Course code 21UZY2A2		Course Title	2021-2024
		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, utility and physiology flowering plants
- To learn the available horticultural techniques to raise new plantlets
- 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
K3	CO3	To identify flowering plants and medicinal plants in their habit.
K4	CO4	To explain different cutting, layering, grafting, budding methods to propagate different plant plants
K5	CO5	To evaluate and learn the basic concept of Plant Biotechnology

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	-	H	H	H	H	H
CO2	H	H	H	M	-	H	H	H	H	H
CO3	H	H	H	H	M	H	H	H	H	H
CO4	H	M	M	H	M	H	H	H	H	H
CO5	H	H	M	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Plant Morphology (Terms only) - Vegetative and floral characters and Economic importance of the following families: Annonaceae, Rutaceae, Fabaceae, Rubiaceae, Acanthaceae, Asteraceae, Lamiaceae, Amarantaceae, Euphorbiaceae and Cannaceae.	**16**
Unit II	Photosynthesis – A brief account of light and dark reactions with reference to C3 plants – Respiration – glycolysis, krebs cycle, oxidative phosphorylation –Nitrogen Cycle- Growth regulators – auxins, gibberellic acid and ABA – Senescence – PCD.	**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 – Plant sources of drugs – Organized drugs, unorganized drugs – dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo-gum resins – Adulteration of plant drugs.	**15**
Unit V	Plant Biotechnology – plant tissue culture: totipotency – micropropagation – meristem culture – Haploids – Synthetic seeds – Cryopreservation – Gene transfer methods – Transgenic plants – Bt cotton and ***Golden rice**.	**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. 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 Ltld., 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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. M. Latha Isabel	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (Zoology)
Course code	21UZY2A3	Course Title	2021-2024
		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 identify 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 illustrate the economically important plant diseases and their control measures
K4	CO4	To prepare micro sections and obtain the skill of drawing the plant tissues technically
K5	CO5	To propagate plants using simple horticultural techniques and to introduce plant tissue culture techniques

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	M	H	H	H	H	H	H
CO3	H	H	M	-	M	H	H	H	H	H
CO4	H	H	H	-	L	H	H	H	H	H
CO5	H	H	H	-	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**Plant Biodiversity** Algae- *Oedogonium*, Diatoms and *Polysiphonia*, Fungi- *Penicillum* and *Agaricus*, Lichens - *Usnea*, Bryophyte - *Riccia*, Pteridophyte - *Lycopodium* and Gymnosperm - *Cycas*, 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 (*Tridax*), secondary structure of dicot stems (*Tridax* and *Polyalthia*). 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, Fabaceae, Rubiaceae, Acanthaceae,	**5**

	Asteraceae, Lamiaceae, Amarantaceae, Euphorbiaceae and Canaceae.	
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	**Pharmacognosy & Plant Biotechnology** Plants yielding drugs: *Spirulina, Penicillium, Ginkgo, Rauwolfia serpentina* and *Phyllanthus amarus*. Plant biotechnology charts.	**5**

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

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. K. Rajalakshmi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY304	Course Title	2021-2024
		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 comprehend the important events in embryo development and fertilization.

Course Outcome

K1	CO1	To introduce and enumerate the theories on plant cell, tissues and cell division
K2	CO2	To summarize the anatomy of various plant parts
K3	CO3	To demonstrate the internal structure and embryology of angiosperms
K4	CO4	To compare the growth and developmental pattern of dicots and monocots
K5	CO5	To evaluate the anatomical adaptations of xerophytes and hydrophytes

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	L	-	-	H	H	H	H	H
CO2	H	H	H	-	-	H	H	H	H	H
CO3	H	H	H	H	-	H	H	H	H	H
CO4	H	H	H	-	-	H	H	H	H	H
CO5	H	H	H	-	-	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**Anatomy:** Plant body – meristems - Apical meristem – Shoot and root – theories – Cambium and its functions - permanent tissues - simple and complex – Vascular bundles and its types - differentiation – dedifferentiation – redifferentiation. Cell division – mitosis.	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 (*Boerhaavia)* and monocot stem (*Dracaena*) - dicot root (*Achyranthes*) - wood structure (sap wood & heartwood).	13
Unit III	Leaf – epidermal tissues – trichomes– stomatal types – internal structure of monocot (Grass) and dicot (*Tridax*) leaves. Anatomy of hydrophytic leaf (*Hydrilla*) and xerophytic leaf (*Casuarina*) – Nodal anatomy.	13
Unit IV	**Embryology:** Flower – anther structure - microsporangium - microsporogensis – structure & development of male gametophyte – ovule – types –megasporangium - megasporogenesis	13

	(*Polygonum*type) – structure and development of female gametophyte – types of embryosac.	
Unit V	Pollination – double fertilization and triple fusion – endosperm – types – embryo – structure and development - dicot (*Capsella*) and monocot (*Najas*) – polyembryony – formation of seed – fruit – ***parthenocarpy.**	13

**Self study topics*

Charts, Powerpoint presentation, Seminar, Quiz, Assignment

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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. M. Latha Isabel	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY3N1	Course Title	2021-2024
		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.
- To bring creativity in techniques like Bonsai, Rockery and Flower arrangement

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 explain the methods in flower arrangements, kitchen garden and terrarium
K5	CO5	To develop entrepreneurial skill in nursery management and landscape designing

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	M	H	M	H	H	H	H	H
CO2	H	M	M	H	L	H	H	H	H	H
CO3	H	H	M	H	M	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H	H
CO5	H	M	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Landscape designing – principles and categories of landscaping - important ornamental plants –Manuring and Irrigation.	**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 – water garden - rockery – hydroponics – topiary - bonsai.	**2**
Unit V	Flower arrangement - cut flowers - role of botanical garden - *ex situ, in situ* 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

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. M. Latha Isabel	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code	21UBY3N2	Course Title		2021-2024
		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.
- To learn the principles of Herbal cosmetics
- To explore the herbal remedies for personal care products

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 illustrate the various personal care remedies using herbs
K4	CO4	To expose the students to prepare home recipes with available herbs
K5	CO5	To enable the students to become entrepreneur in the field of herbal cosmetics

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	H	H	H	H	H	H
CO2	M	H	H	H	H	H	H	H	H	H
CO3	M	M	M	H	H	H	H	H	H	H
CO4	M	M	M	H	H	H	H	H	H	H
CO5	M	M	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Herbal cosmetics– introduction – principles – definition – history – Advantages of Herbal cosmetics over synthetics and limitations	**3**
Unit II	Herbal skin and hair care – Basic requirements of skin hair - Disorders of skin and hair-Herbal hair preparations.	**3**
Unit III	Herbal cosmetics- Aloe vera, carrot, turmeric, neem, Henna, Shihakai, Amla and Coconut oil. Aromatherapy	**2**
Unit IV	Herbal natural soap production - Herbal glycerine soap - Herbal Manicure and pedicure	**2**
Unit V	Herbal home recipes – face pack, hair colorant – tooth powder mouth washes- herbal product marketing.	**2**

Powerpoint presentation and Demonstration

Text Books:

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

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code 21UBY405		Course Title		2021-2024
		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
- To analyze the biomolecules using simple separation techniques

Course Outcome

K1	CO1	To recollect the details about Plant cell, organelles, and their functions
K2	CO2	To revisit and understand the structure and functions of biomolecules
K3	CO3	To illustrate the central dogma of molecular biology
K4	CO4	To explain the biophysical forces and laws of thermodynamics
K5	CO5	To know-how the quantification of biomolecules using selected optical techniques

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	L	M	H	H	H	H	H
CO2	H	H	M	L	H	H	H	H	H	H
CO3	H	H	M	M	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H
CO5	H	H	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**Cell biology:** ***Ultra structure of Plant cell**. Structure and functions of Plant cell organelles— mitosis. Water – structure, properties and functions. **Biomolecules**: structure, classification and functions of carbohydrates (***monosaccharides** and polysaccharides) Lipids- structure, properties, biosynthesis and degradation.	**13**
Unit II	Proteins: Structure and classification of aminoacids – primary- secondary- tertiary and quaternary structure - Ramachandran plot- super secondary structures. Enzymes: Classification, nomenclature, properties and functions – mechanism of enzyme action – activation energy- Michelis- Menton constant – Enzyme inhibitors.	**13**
Unit III	Nucleic acids: Structure and function of nucleic acids (DNA and RNA) – Types of DNA and RNA – DNA supercoiling - DNA	**13**

	replication – Transcription- Translation –Protein synthesis - Reverse transcription.	
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– Colorimetry: principle and laws (Lambert's and Beer's) – Colorimeter and Spectrophotometer. Centrifuge – chromatography (paper, coloumn, thin layer, gas, ion-exchange and affinity) – electrophoresis (AGE & PAGE) – PCR.	**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

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian
Dr. E. Neelamathi			

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code 21UBY406		Course Title	2021-2024
		MAJOR PRACTICAL – II (CELL BIOLOGY, 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
- To impart training in basic separation techniques

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 demonstrate the developmental details of plant embryo
K4	CO4	To prepare permanent micro sections
K5	CO5	To obtain working knowledge in biochemical techniques

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	H	H	H	H	H
CO2	L	H	H	L	H	H	H	H	H	H
CO3	H	H	H	M	L	H	H	H	H	H
CO4	M	H	H	M	L	H	H	H	H	H
CO5	L	L	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**Cell biology**: Charts of prokaryotic & eukaryotic cell and cell organelles, DNA, RNA models. Cell division - mitosis	**6**
Unit II	**Anatomy**: Plant parts, cell - tissue types - Stem: shoot apex, primary structure of dicot stem (*Tridax* and *Cucurbita*), monocot stem (*Sorghum*) - normal secondary thickening in a dicot stem (*Polyalthia*) - anomalous secondary thickening in *Boerhaavia*and *Dracaena* stems. Leaf: stomatal types, dicot (*Nerium*) and monocot (Grass).Root: root apex, primary structure of dicot root (*Dolichos*), monocot root (*Canna*) - normal secondary thickening in and dicot root (Castor). Anomalous secondary thickening in *Achyranthes* root.	**6**
Unit III	**Embryology**: Flower: Permanent slides on structure of anther, ovule, embryosac and endosperm (coconut and areca endosperm) - embryo dissection (*Tridax* and *Waltheria),* Pollinium dissection (*Calotropis*).	**5**

Unit IV	**Biochemistry & Bioinstrumentation:** • 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	• 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 • Working principle of centrifuge, pH meter, colorimeter, spectrophotometer, electrophoresis and PCR.	**5**

Preparation of microsections of selected plants, plant parts and discussing their anatomical details, Separation and Quantification of biomolecules using simple apparatus, Demonstrations

Compiled by **Name with Signature**	**Verified by HOD** **Name with Signature**	**CDC**	**COE**
Dr. K. Rajalakshmi Dr. E. Neelamathi	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code 21UBY4N3		Course Title	2021-2024
		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
- To comprehend the role of national and international agencies

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
K5	CO5	To expose students in getting to know the employability in the field of Remote sensing

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	M	M	L	H	H	H	H	H	H
CO2	M	M	M	M	H	H	H	H	H	H
CO3	M	H	M	L	H	H	H	H	H	H
CO4	L	H	M	M	H	H	H	H	H	H
CO5	L	H	M	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Natural resources – Terrestrial and aquatic (Forest and marine resources) – Biodiversity – Concept – Conservation strategies (*in situ* and *ex situ*) – 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 charge 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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. K. Rajalakshmi	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY4N4	Course Title	2021-2024
		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
- To explore the existing Biological databases and searching tools

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
K5	CO5	To encourage the students to carry out research in the field of Bioinformatics

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	L	L	H	H	H	H	H	H
CO2	H	H	H	L	H	H	H	H	H	H
CO3	M	H	H	M	H	H	H	H	H	H
CO4	L	H	M	M	H	H	H	H	H	H
CO5	L	M	M	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

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 –similarity search- pairwise and multiple sequence alignment – 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. Chakraborthy 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 pivate limited – New Delhi.
6. KhanI.A.,and A. Khanum, 2002, Emerging trends in Bioinformatics, Ukaaz Publications.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. E. Neelamathi	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY507	Course Title	2021-2024
		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 illustrate and identify the flowering plants of the campus
K4	CO4	To explain the herbarium preparation techniques
K5	CO5	To update the Botanical nomenclature, norms and digital taxonomy

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	H	H	H	H	H
CO2	H	H	H	M	M	H	H	H	H	H
CO3	H	M	H	M	L	H	H	H	H	H
CO4	H	M	H	H	L	H	H	H	H	H
CO5	H	L	M	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

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 – chemo 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, Scorphulariaceae, Acanthaceae, and #Lamiaceae. **Monochlamydeae**:Amaranthaceae, Euphorbiaceae.	**13**

Unit V	**Monocots:**#Orchidaceae, Cannaceae, #Liliaceae, Arecaceae, and Poaceae. #*Pollination mechanisms to be included.*	**13**

**Self study topics*

Field study, Identification of plants in the campus, Herbarium preparation

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.

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Dr. E. Neelamathi	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY508	Course Title	2021-2024
		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
- To update the concepts and theories on Prokaryotic and Eukaryotic expression

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 analyze the causes of mutation and DNA repair mechanisms
K5	CO5	To summarize the theories of evolution and origin of life

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	L	H	M	M	M	H	H	H	H	H
CO2	M	H	M	M	M	H	H	H	H	H
CO3	M	H	L	M	M	H	H	H	H	H
CO4	M	H	L	-	H	H	H	H	H	H
CO5	H	H	L	-	H	H	H	H	H	H

H-High; M-Medium; L-Low

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

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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr.R.Kannan	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code	21UBY509	Course Title		2021-2024
		BIOINFORMATICS		Semester 5
Hrs/Week 5				Credits 5

Course Objective

- To introduce classical bioinformatics theory to students
- To focus computer science techniques used in biological studies
- To motivate the students to take-up research in their career

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 distinguish genomics from proteomics
K5	CO5	To encourage the students to take-up research in Bioinformatics and Drug discovery

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	L	M	H	M	H	H	H	H	H	H
CO2	M	H	H	M	H	H	H	H	H	H
CO3	M	H	H	M	H	H	H	H	H	H
CO4	M	H	H	M	H	H	H	H	H	H
CO5	L	H	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

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

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. Chakraborthy 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 pivate limited – New Delhi.
6. KhanI.A. and A. Khanum, 2002, Emerging trends in Bioinformatics, Ukaaz Publications.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. E. Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY510	Course Title	2021-2024
		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
- To instill confidence among the students in taking up research and opting for interdisciplinary career options

Course Outcome

K1	CO1	To revise the basic arithmetic and number system
K2	CO2	To understand the role of mathematics and computers in solving biological problems
K3	CO3	To illustrate the different statistical methods to study a population
K4	CO4	To analyze and interpret a sample data using various methods
K5	CO5	To encourage students to take up research and other interdisciplinary courses for their higher studies

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	L	H	H	H	H	H	H	H	H	H
CO2	M	H	H	H	H	H	H	H	H	H
CO3	M	M	H	H	H	H	H	H	H	H
CO4	L	M	H	H	H	H	H	H	H	H
CO5	L	H	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Maths in Biology – manipulating numbers – units and conversion – units of concentration – normality, molarity, molality 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- Mathematical modelling in biology – Linear growth and decay models and Non-linear growth and decay models.	**13**
Unit III	Biostatistics – introduction - techniques: *Frequency distribution* - ***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	*Theoretical distribution* – binomial, poisson and normal distribution – *Test of significance* - 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 assigments, Seminar, Quiz

Text Books:

1. Alexis Leon 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.
4. Kapur J.N., 1988. Mathematical Modeling. Wiley Eastern Limited, New Delhi.

Reference Books:

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

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Dr. E.Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY5E1	Course Title	2021-2024
		ELECTIVE – I – MICROBIOLOGY AND PLANT PATHOLOGY	Semester 5
Hrs/Week 5			Credits 5

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 demonstrate the food and water samples for contamination
K4	CO4	To get hands-on training in culturing microbes
K5	CO5	To summarize the economically important plant disease

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	M	L	H	H	H	H	H	H
CO2	H	H	M	L	H	H	H	H	H	H
CO3	M	M	H	M	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H
CO5	M	M	M	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**History and Scope of Microbiology-Bacteriology:** Bacteria - morphology and ultra-structure – major features – nutritional types – bacterial respiration - growth and reproduction – ***economic importance** - culture media and pure culture techniques (spread plate, pour plate and streak plate).	**15**
Unit II	**Virology:** Virus – characteristics - ultra structure, shape, - transmission and reproduction (HIV, Rabies & T4 Phage).	**15**
Unit III	**Immunology:** - antigen, antibody and vaccines - antibiotics - microbes producing ethanol, antibiotics (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 - 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	**15**

	control measures of bacterial (citrus canker), fungal (tikka disease of ground nut, paddy blast, and red rot of sugarcane) and viral (TMV) diseases – control of plant diseases- BCA.	

**Self study topics*

Powerpoint presentation, Field observation of diseased plants, Quiz, Seminar, Assignment

Text Books:

1. Ananthanarayanan and Jayarampanikar, Textbook of microbiology, 2017 (10^{th} Edn.)Universities press, Hyderabad.
2. Pelczar JR., M.J., R.D. Reid and E.C.S. Chan, 1983. Microbiology (4^{th}ed.) 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, 7^{th}ed, 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, 3^{rd}ed, Butterworth World Student Reprints.
8. Salle.A.J., Fundamental Principles of Bacteriology, Tata McGraw Hill.
9. Stanier R., General Microbiology, 5^{th}ed, Macmilan Press ltd.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. A. Logamadevi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code	21UBY5E2	Course Title		2021-2024
		ELECTIVE – I – ETHNO BOTANY		Semester 5
Hrs/Week 5				Credits 5

Course Objective

- To study and understand the history, scope, importance and methodology of Ethnobotany.
- To study the importance of Ethno pharmacology and the role of primitive people in conservation of nature.
- To comprehend the knowledge of tribals in herbal medicine

Course Outcome

K1	CO1	To study and understand the history, scope, importance and methodology of Ethnobotany.
K2	CO2	To study the importance of People's Biodiversity Register
K3	CO3	To comprehend the tribal knowledge in medicinal plants
K4	CO4	To learn the issues related with IPR and Biopiracy.
K5	CO5	To recommend the students to take up research in Ethnobotany

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	H	H	H	H
CO2	H	H	M	M	H	H	H	H	H	H
CO3	M	M	L	H	M	H	H	H	H	H
CO4	L	M	L	H	M	H	H	H	H	H
CO5	M	M	M	H	M	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Ethnobotany: Introduction, History, concept, scope and objectives. Major ethnic groups in Tamil nadu. (Kadar, Malayalee, Badugars, Thodars, Pulayars) People's biodiversity Register (PBR). General account of Traditional medical systems of India.	**13**
Unit II	Methodology of Ethno botanical studies. a) Field work b) Herbarium c) Ancient Literature d) Temples and sacred places. Plants used by ethnic groups as food, medicines (Ethnomedicine), beverages, fodder, fibre, resins, oils, fragrances and other uses.	**13**
Unit III	Plants and Tribal medicine: Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiracta indica* b) *Ocimum sanctum* c) *Vitex negundo*. d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria.*	**13**
Unit IV	Ethnobotany as a source of drug. a) Reserpine b) Artemisin c) Gugulipid d) Cocaine e) Strychnine..Role of ethnobotany in	**13**

	modern medicine: (*Trichopus zeylanicus*) *Role of ethnopharmacology in drug development.	
Unit V	Endangered taxa and forest management (participatory forest management). Role of ethnic groups in conservation of plant genetic resources. *Biopiracy, Intellectual Property Rights (IPR). Ethno pharmacology and IPR issue Sharing of wealth concept with few examples from India.	**13**

**Self study topics*

Field study, Inventory of Campus vegetation, Powerpoint presentations, Seminar, Assignment

Text Books:

1. S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
2. S.K. Jain (ed.) Glimpses of Indian. Ethnobotany, Oxford and I B H, New Delhi – 1981
3. S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
4. S.K. Jain, 1990. Contributions of Indian ethnobotany. Scientific publishers, Jodhpur.
5. Cotton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester
6. Rajiv K. Sinha – Ethnobotany -The Renaissance of Traditional Herbal Medicine – INA –Shree Publishers, Jaipur-1996
7. Faulks, P.J. 1958. An introduction to Ethnobotany, Moredale pub. Ltd. London
8. Gary J Martin, 2008. Ethnobotany A Methods manual, Earth scan, London.

Reference Books:

1. Traditional plant medicines as sources of new drugs. P J Houghton in Pharmacognosy Trease and Evan's.16 Ed .2009
2. Cunningham, A. B. (2001). Applied Ethnobotany. Earthscan publishers Ltd. London & Sterling, VA, USA Cotton, C.M. (1996).
3. Ethnobotany-Principles and application. John Wiley& Sons Ltd., West Sussex, England
4. In vivo and in vitro assays Glimpses of ethnopharmacology 1994 Eds. P Pushpangadan ,V George and U.Nyman 5. Faulks, P.J. (1958).

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr.A. Logamadevi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY5E3	Course Title	2021-2024
		ELECTIVE – I – HERBAL COSMETICS AND COSMECEUTICALS	Semester 5
Hrs/Week 5			Credits 5

Course Objective

- To understand the role of herbs as a source of natural and safe cosmetics.
- To learn the principles of herbal cosmetics
- To expose the students to prepare home recipes with available herbs

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 prepare the selected personal care remedies using herbs
K4	CO4	To identify the local plants that can be used up for herbal cosmetics.
K5	CO5	To encourage the students to start-up a small scale Herbal Cosmetic unit

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	M	H	H	M	H	H	H	H	H
CO2	M	H	H	H	M	H	H	H	H	H
CO3	M	L	H	H	M	H	H	H	H	H
CO4	H	M	H	H	M	H	H	H	H	H
CO5	M	M	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Herbal cosmetics – Introduction – principles – definition – history – Advantages of Herbal cosmetics over synthetics and limitations. Process used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics.	**13**
Unit II	Herbal skin care –Skin structure and function - Basic requirements of skin. Herbal products for skin hydration,whitening and ageing - Herbal skin care products: Creams, Lotions, Lipsticks, face packs. Herbal natural soap production process - herbal glycerine soap.	**13**
Unit III	Herbal hair care: Hair structure and function, Keyhair concerns- Hair fall, breakage,split ends and mechanism to solve these issues Basics of formulation development: Emulsions, Shampoo, Conditioners, Gel, Serums and Oils, hair colorant.	**13**
Unit IV	Study ofvarious herbs used in preparation of formulations:A*loe vera*, Carrot, Turmeric, Neem, Citrus peels, Henna, Shihakai, Amla. Almond oil and Coconut oil. Aromatherapy – Tooth	**13**

	powder& mouth washes.	
Unit V	Herbal Manicure and pedicure.General Principles of Quality control and standardization of cosmetics-Raw material control – Packaging material control, finished product control - Shelf testing.	**13**

**Self study topics*

Field study, Powerpoint presentations, Seminar, Assignment

Text Books:

1. Panda H, 2015. Herbal Cosmetics - Hand Book- Asia Pacific Business Press; 3rd Revised Edition, New Delhi, India
2. Babu,S.S., 2000. Herbal cosmetics - Pushkal publishers, Mumbai.

Reference Books:

1. Asharam,2002.Herbal Indian perfumes and cosmetics, Sri Satguru publications, New Delhi, India
2. Sharma.P.P.2018. Cosmetics- Formulation, Manufacturing And Quality Control – Vandama Publications, New Delhi, India

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr.M. Latha Isabel	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY5AL	Course Title	2021-2024
		ADVANCED LEARNER COURSE - I BIOLOGICAL DISASTER – MITIGATION &MANAGEMENT	Semester 5
Hrs/Week SS			Credits 2

Course Objective

- To teach the causes of biological disasters
- To describe the adverse effects of biological disasters
- To suggest the risk reduction and preparedness measures

Course Outcome

K1	CO1	To introduce and define biological disaster
K2	CO2	To know the types of biological disaster
K3	CO3	To acquire knowledge on management of biological disaster
K4	CO4	To explain the legislation on biological disaster
K5	CO5	To summarize the impact of post disaster management

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	M	M	H	H	H	M
CO3	M	M	M	M	H	M	M	H	H	H
CO4	M	M	M	M	L	L	M	H	M	L
CO5	H	H	H	H	M	H	H	H	H	M

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Biological disaster – Introduction – history – definition and types - **Natural disasters**: Flood, Cyclone, Earthquakes, Landslides etc.; **Man-made disasters:**Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc.	**SS**
Unit II	Biological disasters: Epidemic & Pandemic – classification – Biosafety level (BSL1, BSL2, BSL3 and BSL4) – Biologics (category I, II & III) – Bioterrorism (bacterial and viral) Agroterrorism (plants and animals) - Zoonosis.	**SS**
Unit III	Biological disaster: Mitigation & Management - Disease surveillance - Isolation and quarantine - Outbreak investigation and source control - Hygiene and infection control - Vaccination and chemoprophylaxis -Risk communication.	**SS**
Unit IV	Biological disaster: Legislation - The Water (Prevention and Control of Pollution) Act (1974); The Air (Prevention and Control of Pollution) Act (1981); The Environmental (Protection) Act (1986) and the Rules (1986); Disaster Management Act (2005).	**SS**

Unit V	Case studies in biological disaster management & rehabilitation/re-settlement – Plague, tuberculosis, influenza, chickenpox, Meningitis – Ebola, HIV/AIDS - Malaria, dengue, filaria, chikungunya – Spanish flue, SARS – nCovid19 (Corona virus).	**SS**

Field study, Powerpoint presentations, Seminar, Assignment

Text Books:

1. Waugh, W.L., 2005. Handbook of Disaster Management, Crest Publishing House, New Delhi.
2. Gandhi, P.J., 2007. Disaster Mitigates and Management, Deep & Deep Pub., New Delhi.
3. Rai N. & Singh A.K. (ed), 2008. Disaster Management in India, New Royal Book Comp., Lucknow.

Reference Books:

1. National Disaster Management Guidelines—Management of Biological Disasters, 2008. A publication of National Disaster Management Authority, Government of India. ISBN 978-81-906483-6-3, July 2008, New Delhi.
2. Jeanne Guillemin, "Scientists and the History of Biological Weapons: A Brief Historical Overview of the Development of Biological Weapons in the Twentieth Century," EMBO Reports 7, no. S1 (2006): S45–49.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. R. Kannan	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY5S1	Course Title	2021-2024
		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.
K5	CO5	To analyze the techniques to overcome threats

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	M	H	H	H	M
CO3	M	M	M	M	H	M	M	H	H	H
CO4	M	M	M	M	H	L	M	H	M	L
CO5	H	H	H	H	H	H	H	H	H	M

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Basics of network – network media – various operating sustems – 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, mutifactor 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.

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY5S2	Course Title	2021-2024
		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.
K5	CO5	To explore the vulnerabilities and threats

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	M	M	H	H	H	M
CO3	M	M	M	M	H	M	M	H	H	H
CO4	M	M	M	M	L	L	M	H	M	L
CO5	H	H	H	H	M	H	H	H	H	M

H-High; M-Medium; L-Low

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	**3**

	vulnerabilities, exploit kits, malware, phishing and much more. Master defences against phishing, SMShing, vishing, identity theft, scam, cons and other social engineering threats.	

Google classroom

Text Books:

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

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code 21UBY5VA		Course Title	2021-2024
		VALUE ADDED COURSE (MAJOR) – ORGANIC FARMING	Semester 5
Hr/Week 1			Credits 1

Course Objective

- To learn the concept and simple techniques in organic farming
- To comprehend the principles and methods of Integrative farming
- To know the good water and weed management practises

Course Outcome

K1	CO1	To know-how make a compost using pit method
K2	CO2	To learn the preparation of manures, panchakavya
K3	CO3	To know the methods in integrated plant protection management
K4	CO4	To update the procedure in organic crops certification
K5	CO5	To encourage the students to start and practice organic farming in their farms

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	M	H	H	M	H	H	H	H	H
CO2	M	M	H	H	M	H	H	H	H	H
CO3	M	M	H	H	M	H	H	H	H	H
CO4	M	M	H	H	M	H	H	H	H	H
SCO5	L	M	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Biofarming – organic farming – introduction – concept – conventional Vs organic farming	**3**
Unit II	Organic manuring – farmyard manure – green manure – *panchakavya* – fish tonic – horn manure – composting – vermicomposting.	**3**
Unit III	Water and weed management practices – mulching – dry mulching, green mulching, live mulching – stone mulching.	**2**
Unit IV	Integrated plant protection management – biofence – companion plants – herbal pest repellants- neem formulations – bacterial and fungal biopesticides.	**2**
Unit V	Organic crops certification – requirements – procedure – validity – Labelling- organic crops marketing.	**2**

Field visits, Demonstration, Success story – Discussion

Text books:

1. Pawar R.K., 2009. Organic farming for Sustainable Horticulture. Oxford Book Company, India.
2. Arun K. Sharma, 2004. Biofertilizers for Sustainable Agriculture. Agrobios India Ltd, Jodhpur.

Reference Books:

3. Arun K. Sharma, 2004. A Handbook of Organic farming. Agrobios India Ltd, Jodhpur.
4. Dahama A.K., 2009. Organic farming for Sustainable Agriculture. Agrobios India Ltd, Jodhpur

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. K. Rajalakshmi	Dr. R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code	21UBY611	Course Title		2021-2024
		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
- To comprehend the complete Plant metabolism

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 demonstrate photosynthesis and respiration in plants
K4	CO4	To enlist various plant growth regulators and stress physiology of plants
K5	CO5	To summarize the theories and concepts of Plant physiolgy

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	H	H	-	H	H	H	H	H	H
CO2	M	H	H	-	M	H	H	H	H	H
CO3	L	H	H	M	M	H	H	H	H	H
CO4	M	H	H	M	M	H	H	H	H	H
CO5	M	H	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Waterrelations - water potential and its components - ***osmosis** - plasmolysis – imbibition - 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	Plant growth and development - growth regulators - auxins, gibberellins, kinetins,***ethylene and ABA**. Abscission – Senescence – PCD.	**13**
Unit V	Physiology of flowering - photoperiodism – vernalization – biological clocks –Water and salt stress - Plant movements – seed dormancy.	**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.

Compiled by Name with Signature	Verified by HOD Name with Signature	CDC	COE
Dr. M. Latha Isabel	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY612	Course Title	2021-2024
		BIOTECHNOLOGY & GENETIC ENGINEERING	Semester 6
Hrs/Week 5			Credits 4

Course Objective

- To acquire knowledge on plant tissue culture
- To learn the basic principles, tools and techniques in Genetic engineering
- To update the knowledge on Transgenic plants, DNA finger printing and other applications

Course Outcome

K1	CO1	To introduce the concept of totipotency and micropropagation
K2	CO2	To learn the principle of somatic embryogenesis, haploids, synthetic seeds
K3	CO3	To revisit the molecular tools and vectors in genetic engineering
K4	CO4	To understand the principle of gene transfer, blotting techniques and markers
K5	CO5	To summarize the applications of Biotechnology and Genetic Engineering

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	H	M	H	H	H	H	H	H	H
CO2	L	H	M	H	H	H	H	H	H	H
CO3	M	H	M	H	H	H	H	H	H	H
CO4	M	H	M	H	H	H	H	H	H	H
CO5	M	H	M	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

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. Callus and cell suspension culture – meristem culture.	**13**
Unit II	Somatic embryogenesis – principle and applications of somaclonal variation & cryopreservation. Haploid production – anther culture — protoplast isolation, fusion and culture– somatic hybridization – cybrids- ***synthetic seeds**.	**13**
Unit III	**Scope and history of genetic engineering** – molecular tools in genetic engineering: restriction endonucleases, ligases, phosphatases, methylases, and kinases. Host cells **–** vectors-nomenclature – properties of good vector – types of vectors – plasmid (T_i, PBR_{322}), bacteriophage (λ phage) – artificial chromosome vectors (BAC) – transposable elements.	**13**

Unit IV	Gene transfer methods: Natural and Direct – *Agrobacterium* mediated gene transfer – DNA hybridization methods – DNA probes – blotting techniques (southern, northern and western blots) – molecular markers (RAPD, RFLP and SNPs)- selectable markers – Reporter genes.	**13**
Unit V	***Applications :**Transgenic plants – disease resistant (*Bt* cotton) – herbicide resistant (round up soya) – golden rice – *Flavr savr* tomato –DNA Finger printing technique and its applications – DNA barcoding – Biochip- DNA vaccine – recombinant DNA safety guidelines – Intellectual Property Rights (IPR)	**13**

**Self study topics*

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

Text Books:

1. Chawla H.S., 2000. Introduction to Plant Biotechnology, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
2. RamawatK.G., 2001. Plant Biotechnology, S. Chand & Company Ltd, New Delhi.
3. Ignacimuthu S., 1996. Applied Plant Biotechnology, TataMcGraw Hill Publishing Company Ltd, New Delhi.
4. Satyanarayana U., 2005. Biotechnology. Books and Allied (P) Ltd., Kolkata.
5. Dubey R.C., 1995. A text book on Biotechnology (2nd Ed), S. Chand & Company Ltd., New Delhi.
6. Gupta P. K., 2001. Elements of Biotechnology, Rastogi Publications. Meerut.

Reference Books:

1. Street H.E., 1977. Plant tissue culture, Blackwell Scientific Publications, London.
2. Trigiano R.N. and Gray D.J., 1996. Plant tissue culture – concepts and laboratory exercises. CRC Press, Newyork. Brown T.A., 1995. Gene Cloning- an introduction. Chapman and Hall Publication (3rd Ed).New York.
3. Desmond S.T. Nicholl, 2004. An Introduction to Genetic Engineering (2nd Ed). CambridgeUniversity Press.
4. Freifelder D., 1994.Molecular Biology, Narosa Pub. Inc., Boston, London.
5. Nicholl Desmond S.T., 2002. An Introduction to Genetic Engineering (SecondEdition), CambridgeUniversity Press.
6. Primrose S.B. and Twyman R.M., 2008. Gene Manipulation. Blackwell Pub. USA.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. K. Rajalakshmi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY613	Course Title	2021-2024
		HORTICULTURE AND PLANT BREEDING	Semester 6
Hr/Week 5			Credits 4

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
K5	CO5	To encourage students to do consultancy work in Horticulture or to start up a nursey unit.

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H	H
CO2	H	H	M	L	M	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H
CO4	L	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Scope – divisions of horticulture – methods of vegetative propagation – cutting – layering – grafting – manures – fertilizers – irrigation.	**13**
Unit II	Gardening – types of garden – indoor garden – kitchen garden – public garden – important ornamentals – habits and types – garden components – lawn – glass house – rockery – water garden – aquaponics/ hydroponics- topiary.	**13**
Unit III	Production technology – growth regulators in horticulture – plant protection measures for horticultural crops – cultivation of vegetables (Brinjal) – fruits (Banana) – flowers (Jasmine) – plantation crops (Tea) – medicinal plants (Sarpagandha).	**13**
Unit IV	Commercial horticulture – extraction of jasmine concrete – papain – bonsai – flower arrangement – cut flowers – preservation of fruits and vegetables.	**13**
Unit V	Plant breeding – objectives – plant selection – plant introduction – hybridization – hybrid vigour – achievements in crop breeding – sugarcane and paddy.	**13**

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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. M. Latha Isabel	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6E4	Course Title	2021-2024
		ELECTIVE – II – 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 demonstrate 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.

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	H	H	H	H
CO2	M	H	H	M	H	H	H	H	H	H
CO3	M	H	M	M	H	H	H	H	H	H
CO4	M	H	H	H	H	H	H	H	H	H
CO5	M	H	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

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

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. Ananthakrishnan 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.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr.R.Kannan	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6E5	Course Title	2021-2024
		ELECTIVE – II – BIODIVERSITYAND ITS CONSERVATION	Semester 6
Hrs/Week 5			Credits 5

Course Objective

- To learn the concepts of Plant community, distribution and speciation
- To acquire the knowledge on Biodiversity with special reference to western ghats
- To appreciate and follow various conservation strategies

Course Outcome

K1	CO1	To identify the Biodiversity hotspots of the world
K2	CO2	To identify the ethnobotanical perspectives of conservation
K3	CO3	To apply the conservation strategies to protect the western ghats biodiversity
K4	CO4	To explain the international and national efforts to conserve the biodiversity
K5	CO5	To know the employability in the fields of conservation biology

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	H	H	H	H
CO2	M	H	H	M	H	H	H	H	H	H
CO3	M	H	H	L	M	H	H	H	H	H
CO4	L	H	L	M	M	H	H	H	H	H
CO5	H	H	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Introduction to plant community concepts – Ecads, Ecotypes - Major biomes – Phytogeography - Speciation – Theories on speciation – Age and area hypothesis, Continental Drift theory, Dispersal and migration barriers, concept of endemism, peninsular and inland flora.	**13**
Unit II	Biodiversity - Concept, values, types, threats and loss; IUCN categories of rare, endangered, threatened, extinct species. Biodiversity hotspots – Hotspots in India. Conservation strategies: In situ: Biosphere reserves, National Parks, Sanctuaries, Sacred groves; Ex situ: Botanical gardens, seed bank, Pollen bank and Biotechnological interventions	**13**
Unit III	Western Ghats Biodiversity -Habitat, Resources: Flora and fauna Nilgiri Biosphere Reserve, Anamalai Tiger Reserve, Potential threats: Habitat degradation, Inventorying and Management of Resources in Western Ghats: - environmental audits – Ecotourism – Ecorestoration	**13**

Unit IV	Ethnobotany – History of conservation – Traditional Botanical knowledge -Ethnic tribes of Tamilnadu – (Kadar, Malayalee, Badugars, Thodars, Pulayars) – Conservation practises from local tribes*. Documentation and Interpretation of traditional knowledge, biopiracy, IPR, benefit sharing.	**13**
Unit V	Organizations associated with biodiversity management-IUCN, UNEP, UNESCO, WWF, – Convention on Biodiversity – ENVIS, NBA,and NBPGR;-Biodiveristy Information System – Integrated Taxonomic Information System – GBIF, Species 2000, Tree of life.	**13**

**Self study topics*

Field study, Powerpoint presentations, Seminar, Assignment

Text Books:

1. AgrawalK. C., 2009. Biodiversity: Concept Conservation and Management, Nidhi Publishers, India
2. Krishnamurthy, K.V. 2004. An advanced textbook on Biodiversity: Principles and practice. Oxford and IBH. Publ. Co. New Delhi.
3. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publ., New Delhi.

Reference Books:

4. Chapman, J.L. and Reiss, M.J. 1999. Ecology; Principles and Applications. II Ed. Cambridge University Press. New York.
5. Groombridge, B. (Ed.) 1994. Global Biodiversity – Status of the Earth's living resources. Chapman & Hall, London.
6. Melchias,G. 2001. Biodiversity and Conservation. Oxford IBH. New Delhi.
7. Sharma PD. 2001. Ecology and Environment. Rastogi Publications, Meerut.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. K. Rajalakshmi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6E6	Course Title	2021-2024
		ELECTIVE – II – ENVIRONMENTAL BIOTECHNOLOGY	Semester 6
Hrs/Week 5			Credits 5

Course Objective

- To learn the biotechnological intervention in abating pollution
- To acquire the knowledge on EIA, Green audit to ensure sustainable
- To educate the alternative sources of energy

Course Outcome

K1	CO1	To comprehend the quality of air, water and soil as per BIS
K2	CO2	To learn the preparation of documents like EIA, EIS, Green audit
K3	CO3	To illustrate the role of bioindicators in monitoring the environment
K4	CO4	To analyse the concepts of bioremediation and biological detoxification
K5	CO5	To evaluate the production and utility of non- conventional energy resources

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	H	H	H	H	H	H	H	H	H
CO2	L	H	H	M	H	H	H	H	H	H
CO3	H	H	M	M	H	H	H	H	H	H
CO4	M	H	M	H	H	H	H	H	H	H
CO5	M	H	M	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Environmental Biotechnology – Introduction – Scope of Biotechnology in pollution abatement – quality criteria for air, water, soil and noise (BIS) – biological treatment of sewage and solid wastes – biofilters - **Role of Government in pollution control**	**13**
Unit II	Environmental Impact Assessment (EIA) – Risk analysis – EIS – Environmental planning and management – Green audit - Carbon budget- Remote sensing and GIS for resource mapping and management	**13**
Unit III	Biotechnology for pollution assessment and monitoring- biomonitoring – biosensors – biofilms – biochip in Environmental analysis – Bioindicators in pollution monitoring (Bacteria, Algae Lichens and higher plants) – cytotoxicity tests.	**13**
Unit IV	Biodegradation of hazardous wastes (Plastics, microplastics) – xenobiotic compounds and radioactive wastes – bioremediation – phytoremediation – bioleaching – biosorption – biological	**13**

	detoxification	
Unit V	Biomass energy – Biofuels – Biogas – Biological hydrogen production–Solar energy* – wind energy – Tidal energy – Ocean Thermal Energy – Geothermal Energy – Energy audits	**13**

**Self study topics*

Field study, Powerpoint presentations, Seminar, Assignment, Group Discussion

Text Books: .

1. Chatterji, A.K. 2007. Introduction to Environmental Biotechnology, 2nd ed. Prentice Hall Pvt. Ltd, New Delhi.
2. Indu Shekhar Thakur. 2019. Environmental Biotechnology: Basic concepts and Applications (2nd ed.) Dreamtech Press, Delhi

Reference Books:

1. Ritmann, B. E. and McCarty, P.L. 2020. Environmental Biotechnology: Principles and Applications (2nd Ed), McGraw Hill, New York.
2. Sunil Khanna and Krishna Mohan (Eds). 1995. Wealth from Waste. Tata Energy Research Institute, New Delhi.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr.K. Rajalakshmi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6E7	Course Title	2021-2024
		ELECTIVE – III – BIOPROSPECTING	Semester 6
Hrs/Week 5			Credits 5

Course Objective

- To understand the current practices in Bioprospecting
- To know the basics and concepts of pharmaceutical bioprospecting
- To learn the marine and microbial metabolites and its applications

Course Outcome

K1	CO1	Understand the basic concepts of bioprospecting
K2	CO2	Learn the assays in medical bioprospecting
K3	CO3	Recognize the value of marine bioresources
K4	CO4	Analysethe techniques and applications of microbial populations
K5	CO5	Summarize the significance of forest products in day-to-day life

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	H	H	H	H
CO2	H	M	M	L	M	H	H	H	H	H
CO3	M	M	M	L	H	H	H	H	H	H
CO4	M	M	M	M	H	H	H	H	H	H
CO5	H	H	M	M	M	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Bioprospecting: Definition – Introduction - Current practices in Bioprospecting for conservation of Biodiversity and Genetic resources. Bioprospecting Act: Introduction - Phases of Bioprospecting - Exemption to Act. Fields of Bioprospecting.	**13**
Unit II	Medicinal Plants Bioprospecting/ Pharmaceutical Bioprospecting: for new drugs - assays in bioprospecting. Antioxidant assay – NO free radical scavenging assay - Antigenotoxicity assay – MTT assay - Antiviral activities of plants – SRB assay.	**13**
Unit III	Marine Bioprospecting: Sources of marine planktons and their bioprospecting - isolation and cultivation of marine bioresources - isolation of marine yeast and its industrial applications - bioactive chemicals from seaweeds and their applications*.	**13**
Unit IV	Microbial Bioprospecting: Isolation of microbial metabolites and their bio-activity. Endophytic microbial products as antibiotics.	**13**
Unit V	Origin, evolution, botany, cultivation and uses of food, fodder, fibers, oil yielding crops, wood and timber, non-wood forest products(NWFPS): bamboos, gums, dyes, resins, fruits etc.	**13**

**Self study topics*

Powerpoint presentations, Seminar, Assignment

Text Books:

1. Thakur, R.S., Puri, H.S. and Husain, A. (1969). Major medicinal plants of India, Central Institute of medicinal and aromatic plants, Lucknow.
2. Swaminathan, M.S. and Kocchar, S.L. (Es.) (1989). Plants and Society, MacMillan Publication Ltd.,
3. Sharma, O.P. (1996). Hills Economic Botany, Tata McGraw Hill co., Ltd., New Delhi,
4. Kocchar, S.L. (1998). Economic Botany of the tropics, II Edn. MacMillan India Ltd.,

Reference Books:

5. Arora, R.K. and Nayar, E.R. (1984), Wild relatives of crop plants in India, NBPGR Science Monograph No.7.
6. Baker, H.G. (1978), Plants and civilization. Ill Ed. (A. Wadsworth, Belmount).
7. Bole, P.V. and Vaghani, Y. (T986). Field guide to common Indian trees, Oxford University Press, Mumbai.
8. CSIR (1986), the useful plants of India Publication and Information directorate, CSIR^ New Delhi.
9. CSIR (1948 - 1976) the wealth of India, 53

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. E. Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6E8	Course Title	2021-2024
		ELECTIVE – III – BIOFERTILIZERS	Semester 6
Hrs/Week 5			Credits 5

Course Objective

- To learn about the bioavailability of plant nutrients
- To comprehend the principles of Nitrogen fixation and Phosphate solubilization
- To learn the utility of Biofertilizers in organic farming

Course Outcome

K1	CO1	To know the microbes that are useful in the production of Biofertilizers
K2	CO2	To understand the various microbial metabolisms in fixing Nitrogen
K3	CO3	To learn know-how techniques of mass production of Biofertilizers
K4	CO4	To realize the role of VAM in Phosphate mobilisation
K5	CO5	To identify the government initiatives in the mass production of Biofertilizers

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	M	M	H	H	H	H	H	H	H
CO3	H	M	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	H	H	H	H
CO5	M	H	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Biofertilizers – Introduction – advantages - factors affecting the efficiency of biofertilizers- carrier materials – inoculants – general account on microbes as biofertilizers.	**13**
Unit II	Nitrogen fixers – Blue Green Algae - Nitrogen fixation by *Anabaena*, *Nostoc*, *Oscillatoria*, *Tolyopthrix – Azolla- anabaena* association – Nitrogen fixation – *Azolla* in rice cultivation.	**13**
Unit III	Nitrogen fixers -Bacteria – Symbiotic -*Rhizobium*, *Azospirillum* – *Azospirillum* – isolation and mass multiplication; Rhizobium – Identification, isolation and mass multiplication; Free-living *Azotobacter*, *Klebsiella* – *Azotobacter* – inoculum, mass production.	**13**
Unit IV	Phosphate solubilizers – factors affecting phosphate solubilisation – *Pseudomonas, Bacillus megaterium*; Mycorrhizal association – types – occurrence, colonization and inoculum production of VAM – effect on plant growth	**13**
Unit V	Biofertilizers – Application and Marketing– seed treatment, root dipping, soil applications –Role of Government initiatives in promotion of Biofertilizers* - National Project on Development	**13**

	and use of Biofertilizers (NPDB) – Integrated nutrient management.	

**Self study topics*

Field study, Powerpoint presentations, Seminar, Assignment, Industrial visits

Text Books:

1. Arun K. Sharma, 2004. Biofertilizers for Sustainable Agriculture. Agrobios India Ltd, JodhPur.
2. Dahama A.K., 2009. Organic farming for Sustainable Agriculture. Agrobios India Ltd,Jodhpur.
3. Mahendra K. Rai, 2005. Hand book of Microbial biofertilizers, The Haworth Press, Inc. NewYork.

Reference Books:

1. Amitava Rakshit, Vijay Singh Meena, Manoj Parihar, H.B. Singh and A.K. Singh. 2021.
2. Biofertilizers: Volume 1: Advances in Bio-inoculants. ELSEVIER, Woodhead Publishing, UK.
3. Bhoopander Giri, Ram Prasad, Qiang-Sheng Wu. 2019. Biofertilizers for Sustainable Agriculture and Environment. Springer.
4. NIIR Board, 2012. The Complete Technology Book on Bio-Fertilizer and Organic Farming, II Ed, NIIR Project Consultancy Services, New Delhi.
5. Subbarao, N.S. 2017. Bio-fertilizers in Agriculture and Forestry, IV Ed, Medtech, USA.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. K. Rajalakshmi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6E9	Course Title	2021-2024
		ELECTIVE – III – SEED TECHNOLOGY	Semester 6
Hrs/Week 5			Credits 5

Course Objective

- To understand the seed physiology, seed testing and seed storage
- To acquire knowledge on the seed certification procedures
- To learn the role of national agencies in seed development

Course Outcome

K1	CO1	Learn the development of a seed
K2	CO2	Understand the testing procedures for seed purity
K3	CO3	Classify the quality of seeds and certification
K4	CO4	Acquire skills on seed marketing
K5	CO5	Summarize the role of national agencies in seed development

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	H	H	H	H
CO2	H	H	M	M	M	H	H	H	H	H
CO3	M	H	H	L	M	H	H	H	H	H
CO4	M	M	H	M	H	H	H	H	H	H
CO5	H	M	H	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Seed technology - history, concepts and scope – types of seed – seed development programme - Role of National seed corporation (NSC), Tarai development corporation (TDC), and State farm corporation (SFC) agencies in development of Indian seed industry.	**13**
Unit II	Seed- Fertilization – embryo genesis and seed formation – development and maturation – seed structure and composition – seed quality characteristics- Seed Farm Management – Breeders seed – terminator seed – seed bank	**13**
Unit III	Seed testing – principles and importance heterogeneity and genuineness – Seed purity test – seed germination test – seed viability test – seed vigour test – seed health test – seed moisture test.	**13**
Unit IV	Seed processing – concepts and principles – methods of seed conditioning – Seed drying and cleaning – Seed treatment – advantages and kinds – Seed storage - principles and methods – factors affecting seed storage – Seed marketing.	**13**
Unit V	Seed Certification – objectives and concepts – function of seed	**13**

	certification agency - General certification standards – Essential qualities of certified seeds - Classes of seed - Seed legislation in India – Seed act – Seed control order – Essential commodity act – Requirement for sale of seeds	

**Self study topics*

Field study, Powerpoint presentations, Seminar, Assignment

Text Books:

1. Sumati Narayan Rajeev Kumar, Sushil Kumar Swarnkar, Sunil Kumar Singh , 2016. A Text book of seed technology, Kalyani publishers.
2. Phundan Singh, 2013. Principles of seed technology, Kalyani Publications.
3. Agarwal.R.L. 2004. Seed Technology, IVth Edition, Oxford and IBH Publishers Company, New Delhi.

Reference Books:

1. Ramamoorthy, K. and K. Sivasubramaniam. 2006. Seed Technology, Ready Recknoner, Agrobios Publishers, Jodhpur, Rajasthan
2. Sivasubramaniam.K. and S.K Yadav. 2007. A Dictionary of Seed Technological Teems, Kalyani Publishers, Ludhiana
3. Amarjit S. Basra, 2008. Handbook of seed science and technology, CRC Press.
4. Jana B.L., 2015. Principles of seed technology, Aavishkar publishers, Jaipur.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. E. Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)	
Course code	21UBY614	Course Title		2021-2024
		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 illustrate the 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

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	…	PSO1	PSO2
CO1	H	H	M	M	H	H	H		H	H
CO2	H	H	M	M	M	H	H		H	H
CO3	M	H	H	L	M	H	H		H	H
CO4	M	M	M	M	H	H	H		H	H
CO5	H	M	M	M	H	H	H		H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**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.	**6**
Unit II	**Genetics and Evolution:** Solving problems on Mendelian inheritance and interaction of genes; charts and diagrams from genetics and evolution.	**5**
Unit III	**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	**5**

	9. Molecular visualization	
Unit IV	**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. **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 5. Test of significance - Chi-square test and Student't' test. **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 6. 4. Creation of database in MS-Access.	**5**
Unit V	**#Microbiology &Plant pathology** **Demonstrations:** 1. Microscopy 2. Culture media preparation 3. Pure culture techniques (streak, pour and spread plate) 4. Antibiotic assay **Individual experiments** 1. Smear preparation 2. Simple staining 3. Differential staining 4. Hanging drop experiment ***Charts***: Ultra structure of bacterium, HIV, rabies, T_4 phage, antigen and antibody and food and industrial microbiology related charts. Specimens/charts/ of diseases: 1. Citrus canker 2. Red rot of sugar cane 3. Tikka disease of ground nut 4. Paddy blast 5. TMV **#Ethno Botany** 1. Collection, processing and preservation of ethnobotanical specimens 2. Identify and document plant parts used in preparation of crude drugs/herbal formulations **#Herbal Cosmetics and Cosmeceuticals** 1. Preparation of herbal skin care products 2. Preparation of herbal hair care products 3. Herbs used in cosmetics and aroma therapy.	**5**

Optional papers

Identification of plants, Demonstrations, culture techniques

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Dr. M. Latha Isabel Dr. E.Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY615	Course Title	2021-2024
		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 *in vitro*
K4	CO4	To learn the bioinformatics tools to analyse the protein structure
K5	CO5	To study the vegetation using Quadrat and line transect method

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	H	H	H	H
CO2	H	H	M	M	M	H	H	H	H	H
CO3	M	H	H	L	M	H	H	H	H	H
CO4	M	M	M	M	H	H	H	H	H	H
CO5	H	M	M	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	**Plant physiology** **Individual experiments:** 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 Co_2 concentrations & different light intensities using wilmots bubbler **Plant physiology demonstration experiments:** 7. Light screen experiment 8. Amylase activity 9. Soil nitrification 10. Determination of respiratory quotient	**6**

	11. Essentiality of mineral elements on plant growth – Hydroponics	
Unit II	**Biotechnology & Genetic Engineering:** Charts/spotters on Genetic Engineering and biotechnology Demonstration 1. Media for plant tissue culture 2. Callus induction 3. Regeneration of plantlet 4. Synthetic seeds	**5**
Unit III	**Horticulture and Plant Breeding** • Charts and specimens • Demonstration on propagation techniques • Demonstration on fruit/vegetable preservation	**5**
Unit IV	**# 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. **# Biodiversity and its Conservation** 1. Biosphere reserves 2. Hotspots 3. Sacred groves **# Environmental Biotechnology** 1. Bioindicators 2. Green auditing 3. Biofuels 4. Remote sensing	**5**
Unit V	**# Bioprospecting** 1. Marine bioproducts 2. Microbial bioproducts 3. Anti-oxidant assay **# Biofertilizers** 1. Mass culture of *Azolla, Rhizobium and Nostoc* 2. Identification and isolation of microbial inoculants **# Seed Technology** 1. Simple tests on seed purity, vigor, viability, germination and moisture content. 2. Seed processing and storage methods	**5**

Optional papers

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. R. Kannan Dr. M. Latha Isabel	Dr. R. Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6AL	Course Title	2021-2024
		ADVANCED LEARNER COURSE - II BIONANOTECHNOLOGY	Semester 6
Hrs/Week SS			Credits 2

Course Objective

- Toimpart basic knowledge on the nano level integration of chemistry, physics and biology.
- To learn the concept of biomaterials and biomolecules as bases for inorganic structures.
- To know the role biomolecules as nano widgets.
- To study the diversity of application of nanodevices

Course Outcome

K1	CO1	To study the fundamentals of bionanotechnology.
K2	CO2	To learn the role of biomolecules at nano scale.
K3	CO3	To study the nanomaterials and devices and their functions at cellular level.
K4	CO4	To acquire knowledge on mimicking the biological systems.
K5	CO5	To inculcate the role of nanobots and their diversified application.

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	M	M	H	H	H	H	H	M	M
CO3	H	H	H	M	M	M	M	H	M	M
CO4	M	M	M	L	L	L	M	H	M	M
CO5	H	H	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Introduction to Nanotechnology and Bionanotechnology – Cellular Machines: - Nanomaterials (nanoparticles, nanotubes, nanowires, manocrystals, block co-polymers) and Biomacromolecules (Nucleic acid and protein structure, MAGE).	**SS**
Unit II	Fundamentals of biological systems and bionanotechnology - Sensors - optics, acoustics: ion selective electrodes – gas and enzyme & protein based sensing principles – DNA Amplification, DNA probes and arrays, DNA application and liposomes, fluidics, nanomachining – Biomimetics/biomimicry (superhydrophobic structures-lotus effect)	**SS**
Unit III	Bionanomaterial production - Fabrication techniques, imaging and nanipulation tools at the Nanoscale - nanoscale devices and circuits e.g. carbon nanotubes, FETs Quantum dots.	**SS**
Unit IV	Bionano robotics – nano/molecular – communicationnano-	**SS**

	navigation – nano-scale manipulation and control, nano robots.	
Unit V	Application of Bionanotechnology – Medicine – pharmaceuticals – Agriculture – Food – Cosmocetutical – Environment.	**SS**

Field study, Inventory of Campus vegetation, PowerPoint presentations, Seminar, Assignment

Text Books:

1. K.K.Jain, Nano Biotechnology, Horizions Biosciences, 2006.
2. Introduction to Nanotechnology, Charles P. Poole, Jr.Frank J. Owens, A John Wiley 81Sons, Inc., Publication, (2003).

Reference Books:

1. Nanobiotechnology: Concepts,Applications and Perspectives (2004), Christof M.Niemeyer (Editor), Chad A. Mirkin (Editor), Wiley VCH.
2. Nanotechnology 101, John Mongillo, Greenwood Press, (2007).

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr.R.Kannan	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6S3	Course Title	2021-2024
		SKILL BASED ELECTIVE (MAJOR) – FOREST BOTANY	Semester 6
Hr/Week 1			Credits 2

Course Objective

- To impart theoretical and practical knowledge in all the areas of forestry
- To educate the students with conservation practices to protect Biodiversity
- To learn and update the Environmental Acts

Course Outcome

K1	CO1	To know the history and types of forests
K2	CO2	To understand the principle of conservation
K3	CO3	To develop interest in marketing of forest products
K4	CO4	To explain the Environmental acts of India
K5	CO5	To enable students to take up research in Forest Botany

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	M	H	H	H	H	H
CO2	M	H	M	M	M	H	H	H	H	H
CO3	M	M	L	M	M	H	H	H	H	H
CO4	M	M	M	M	H	H	H	H	H	H
CO5	H	H	M	H	M	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	History of forest development; Forest types of India, Dendrology, Afforestation, Deforestation and Social forestry.	**3**
Unit II	Fundamentals of Wild Life, Forest Pathology, Forest Ecology, Biodiversity & Conservation	**3**
Unit III	Forests Soils: Classification, factors affecting soil formation; physical, chemical and biological properties. Soil conservation. Role of forests in conserving soils.	**2**
Unit IV	Non-Timber Forest Products (NTFPs)\ - Principles and establishment of herbaria and arboreta. Conservation of forest ecosystems. Clonal parks. Marketing and Trade of Forest Produce	**2**
Unit V	Forest laws, necessity; general principles, Indian Forest Act 1927; Forest Conservation Act, 1980; Wildlife Protection Act 1972.Endangered plants, Endemism and Red Data Books.	**3**

Charts, Powerpoint presentation, Demonstration

Text Books:

1. S. Prabhu K. Manikandan , Indian Forestry A Breakthrough Approach to Forest Service 7th Edition , Jain Brothers publications, Rajasthan, India.
2. K. P. Sagreiya, Sharad Singh Negi, Forests and Forestry, National Book Trust, India
3. Sharad Singh Negi · Forest Policy and Law, International Book Distributors, Dehradun-India
4. Ajay.S, Rawath , Indian forestry, A perspective, Indus publishing company, New Delhi

Reference Books:

1. K.T. Parthiban, N. Krishnakumar, M. Karthick - introduction to Forestry & Agroforestry, Scientific publishers, Jodhpur, India
2. Richard P. Tucker -A Forest History of India,SAGE publications, New Delhi, India

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. A. Logamadevi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code	21UBY6S4	Course Title	2021-2024
		SKILL BASED ELECTIVE (MAJOR) – MUSHROOM CULTIVATION	Semester 6
Hr/Week 1			Credits 2

Course Objective

- To acquire knowledge on identifying edible mushrooms
- To know the mushroom culture techniques
- To encourage the students to start-up a mushroom culture unit

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
K5	CO5	To motivate the students to start-up a mushroom culture unit

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H	H
CO2	M	M	H	H	M	H	H	H	H	H
CO3	M	M	H	H	M	H	H	H	H	H
CO4	H	M	H	H	M	H	H	H	H	H
CO5	L	M	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

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:

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

Reference Books:

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

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. E. Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian

Programme Code	B.Sc.,	Programme Title	Bachelor of Science (BOTANY)
Course code 21UBY6VA		Course Title	2021-2024
		VALUE ADDED COURSE (MAJOR) – COCONUTFARMING	Semester 6
Hr/Week 1			Credits 1

Course Objective

- To acquire knowledge on the coconut cultivation
- To identify coconut pests and diseases
- To learn to make value added products of coconut

Course Outcome

K1	CO1	To understand the value of coconut products
K2	CO2	To learn the coconutfarming practices
K3	CO3	To diagnose the diseases and pests of coconut
K4	CO4	To create interest in making value added products of coconut
K5	CO5	To motivate the students to marke value added products of coconut

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	H	M	H	H	H	H	H
CO2	M	H	H	H	M	H	H	H	H	H
CO3	H	H	M	H	M	H	H	H	H	H
CO4	M	H	H	H	M	H	H	H	H	H
CO5	L	H	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Unit	Content	Hrs
Unit I	Coconut cultivation - History and scope - Origin and Distribution of coconut - Area and Production of coconut in the world - Composition and uses of coconut - Climate and Soil for coconut - Cultivars in coconut - Hybrids.	**2**
Unit II	Establishment of coconut plantation – selection of seed plantation, mother palms, seednuts and seedlings – methods of seednut sowing – vertical and horizontal method – polybag method for nursery sowing.	**2**
Unit III	Planting of seedlings – Time of planting – Preparation of pits for planting – spacing – manuring – pocket manuring – irrigation – cropping.	**3**
Unit IV	Plant protection – pests of coconut - Eriophyid mite (*Aceria guerreronis K.*,) – diseases of coconut - bud rot – button shedding – harvest and yield – storage and seasoning of harvested nuts.	**3**
Unit V	Coconut value addition – tender coconut – snowball tender nut –	**2**

	coconut chips – virgin coconut oil – coir pith – coconut shell charcoal – activated carbon – shell flour – handicrafts from coconut – coconut wood.	

Field visits, Demonstration, Success story - Discussion

Text Books:

1. Thampan P.K., 1981. Handbook of Coconut palm. Oxford press, IBH.
2. Peter K.V., 2002. Plantation crops. National Book Trust.
3. Chopra V.L. and Peter K.V., 2005. Handbook of Industrial crops. Panima.
4. Srivastava H.C., Vatsaya B. and Menon K.K.G., 1986. Plantation crops – opportunities and constraints. Oxford Press, IBH.

Compiled by Name with Signature	**Verified by HOD Name with Signature**	**CDC**	**COE**
Dr. E. Neelamathi	Dr.R.Kannan	Mr. K. Srinivasan	Dr. R. Manicka Chezhian