Vellalar College for Women (Autonomous), Erode - 12.

Master of Science in Botany

2018 - 2019 Onwards

Course Content and Scheme of Examinations (CBCS&OBE pattern)

(Applicable to students admitted during the academic year 2018-19 and onwards

Semester I

	Subject Code	Title of the Paper	Inst. Hrs. /Week	Exam. Dur. Hrs.	Max. Marks			Credits
					CIA	ESE	Total	
Study Components	18BOPC101	Paper I Phycology, Bryology &Lichenology	6	3	25	75	100	4
	18BOPC102	Paper II Mycology & Phytopathology	5	3	25	75	100	4
	18BOPC103	Paper III Pteridophytes, Gymnosperms &Palaeo botany	5	3	25	75	100	4
	18BOPC104	Paper IV Anatomy & Embryology	5	3	25	75	100	4
		Practical I- Papers I, II & V	6					
	18BOPN101	Non Major Elective	3	3	25	75	100	5
Total							500	21

Semester II

Core	18BOPC205	Paper V Cell Biology &Plant Tissue culture	6	3	25	75	100	4
	18BOPC206	PaperVI Genetics, Germplasm Conservation & Plant Breeding	6	3	25	75	100	4
	18BOPE201	Elective I Microbes & Industry	6	3	25	75	100	4
		Practical II - Papers III , IV& VI	8					
	18BOPCP01	Practical I - Papers I, II& V (Exam)		4	40	60	100	3
	18BOPCP02	Practical II - Papers III, IV, VI (Exam)		4	40	60	100	3
	18BOPS201	*Skill Based Subject I	3	1*	40	60	100	5
		Library	1					
* Online Examination Total							600	23

SKILL BASED SUBJECTS		
Subject	Subject Code	Title of the Paper
1	13BOPS201	Advanced Multi Skill Development Paper*
2	16BOPS302	Horticulture
3	16BOPS303	Green Medicine
SELF LEARNING PAPER		
Subject	Subject Code	Title of the Paper
1	13BOPSL02	Wealth from wastes (optional)
*Online examination for three units for a maximum of 60 marks. Units IV & V are CIA for a maximum of 40 marks.		

Components of CIA Marks(Theory)

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
10	5	10	25

Components of CIA Marks (Practicals)

Tests (I & II)	Record	Performance	Model Examination	Total
10	5	15	10	40

CIA

Bloom's Category	Section	Choice	Marks	Total
K2	A	Compulsory	2 x 2 = 4	
K3, K4	B	Either / Or	2 x 5 = 10	
K4, K5	C	Either / Or	2 x 8 = 16	30

Model and End Semester Examination

Bloom's Category	Section	Choice	Marks	Total
K2	A	Compulsory	5 x 2 = 10	
K3, K4	B	Either / Or	5 x 5 = 25	
K4, K5	C	Either / Or	5 x 8 = 40	75

NON MAJOR ELECTIVE

Components of CIA

Test - 10 Marks
Assignment / Seminar / Subject Viva - 5 Marks
Model Examination- 10Marks
Total - 25 Marks

Section	Choice	Marks	Total
	Open Choice (5 out of 8)	5 x 15	75

SEMESTER I

CODE	COURSE TITLE
18BOPC101	PHYCOLOGY, BRYOLOGY AND LICHENOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To provide an adequate knowledge about the lower plant groups and their morphological characteristics, internal anatomical features of lower plants, reproduction methods, alternation of generations, general plant life cycle pattern and their role in human welfare

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Evoke the information about various plant groups from primitive to highly evolved forms	K1,K2
CO2	Acquire the knowledge of morphology and lifecycle of lower plants and update with affinities and evolutionary relationships to higher plants	K2,K3
CO3	Analyse the knowledge and role of Algae, Bryophytes and Lichens in the environmental protection	K3, K4
CO4	Develop inter-disciplinary research and to apply entrepreneurial skills in the commercial values of Algae and Lichens	K3
CO5	Interpret the novel ideas and use of plant resources for food and medicine and support knowledge of algae production to the local farmers community	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT - I **(18 hrs.)**

PHYCOLOGY : Classification of Algae (Fritsch, 1945)- - Range of thallus – Pigmentation - Reproduction and life cycle patterns of Chlorophyceae and BacillariophyceaePhylogeny and interrelationship

UNIT - II **(18 hrs.)**

Comparative study of the range of structure – reproduction and life cycle pattern of - Phaeophyceae- Rhodophyceae – Cyanophyceae - Phylogeny and inter relationship-Economic importance of Algae

UNIT - III **(18 hrs.)**

BRYOLOGY: Classification (Reimer's ,1954) Origin– Distribution – Structure – Reproduction and life cycle of Hepaticae – Takakiales – Calobryales – Jungermanniales – Metzgeriales – Sphaerocarpales- Monocleales and Marchantiales

UNIT - IV **(18 hrs.)**

Distribution – structure - reproduction and life cycle of Anthocerotae – Anthocerotales- Bryopsida - Sphagnales - Andreaeales – Funariales - Polytrichales – Fossil Bryophytes - Economic importance

UNIT - V **(18 hrs.)**

LICHENOLOGY : Classification of Lichens (Hale, 1969) - Origin and evolution of lichens.Occurrence and Inter-relationship of Phycobionts and Mycobionts- Structure and Reproduction in Ascolichens- Basidiolichens and Deuterolichens- Lichens as indicators of Pollution- Economic importance of Lichens

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Vashishta, B.R., Sinha, A.K. &Adarshkumar	Bryophyta	Chand & Company Ltd., New Delhi	2010-Revised Edition .
2.	R.M. Johri Snehlata Sandhyasharma	Text book of Algae	Dominant Publishers	2009-1st Edition
3.	Foster, A. S.and Gifford, E. M.	Comparative Morphology of Vascular Plants	W.H. Freeman and Co	1973-1st Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Fritsch, F.E.	Structure and reproduction of the Algae	Cambridge University Press	1935-1945 Vol. I, II & III
2.	Rashid..A.	An Introduction to Bryophytes.	Vikas Publisher	2008, Reprint

Web Resource

www.biologydiscussion.com/algae/cyanophyceae-characteristics-occurrence

https://en.wikipedia.org/wiki/Chlorophyceae

https://www.britannica.com/science/brown-algae

https://bryology.uconn.edu/eeb3240-bryology-lichenology/

https://biologyboom.com/type-anthoceros/

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar,Algal collection

SEMESTER I

CODE	COURSE TITLE
18BOPC102	MYCOLOGY AND PHYTOPATHOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To understand the range of thallus, reproduction and life cycle patterns of Fungi and interpret the phylogeny and inter relationship of Fungi with uses of Fungi to human beings

To understand the plant – pathogen interaction and to classify the management of diseases

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Analyse the classification, physiology, ecology, pathogenesis, nutrition, reproduction and life cycle patterns and evolution within fungal biodiversity	K3, K4
CO2	Analyze phylogeny and Interrelationships of Fungi and plant – pathogen interaction	K3, K4
CO3	Interpret the interaction between the causal agent and the diseased plants in relation to environmental conditions	K3
CO4	Apply the economic importance of Fungi for sustainable global development	K4
CO5	Evaluate Fungi for making renewable substitutes for products to valuable food and feed ingredients and production of new biological drugs	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	M	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(15 hrs.)**

Classification of fungi (Alexopoulos& Mims 1983). Cell wall composition- mode of nutrition- Range of Structure – Life cycle and Interrelationship of Myxomycetes - Chytridiomycetes, Hypochytridiomycetes , Oomycetes and Zygomycetes

UNIT II **(15 hrs.)**

Range of Structure – Life cycle and Interrelationship of Ascomycetes - Hemiascomycetidae, Plectomycetidae, Hymenoascomycetidae and Loculoascomycetidae

UNIT III **(15 hrs.)**

Range of Structure - Life cycle and Interrelationship of Basidiomycetes and Deuteromycetes. Heterothallism - Economic importance of fungi

UNIT IV **(15 hrs.)**

Plant Pathology: Classification of plant diseases – Principles of plant disease control - cultural, biological and chemical - Effect of environment on disease development. Causal organism, Symptoms, Disease cycle and control measures of little leaf of Brinjal, Black wart of Potato, Blight of Paddy and Red rot of sugarcane

UNIT V **(15 hrs.)**

Pathogenesis: Penetration and entry - Enzymes in plant disease – Cell wall degrading enzyme-Toxins,Dissemination of Plant pathogens - Defense mechanism

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Vashishta, B.R., Sinha, A.K.,	Fungi Botany for degree students	S. Chand &Co, New Delhi	2007, Revised Edition
2.	Mehrotra, R.S.,	Plant Pathology	Tata McGraw Hill Publishing Company Ltd., New Delhi	2003, 2nd Edition
3.	Mishra,A./ Bohra,A.andMishra,A.	Plant Pathology	Agrobios India	2011, 1st Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Starchester,K.	Nature and Prevention of Plant Diseases	J.V. Publishing House	2006, 2nd Edition
2.	John Webster and Roland W.S.Weber	Introduction to Fungi	Cambridge University Press	2007, 3rd Edition

Web Resource

www.biologydiscussion.com/fungi/classification-of-fungi-by-various.../46471

www.knowledgebank.irri.org/decision-tools/rice-doctor/rice...fact.../bacterial-blight

www.biologydiscussion.com/fungi/life-cycle-of-albugo-with-diagram.../63415

https://www.elsevier.com/.../principles-of-plant-disease-management/...

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar,Field visit

SEMESTER I

CODE	COURSE TITLE
18BOPC103	PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To understand the position of Pteridophytes and Gymnosperms in plant kingdom, to relate their morphology, anatomy & reproduction and to analyze the evolutionary line

To evaluate the age of most *important fossils* and to assess their scientific perspectives

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the phylogenetic relationships among Pteridophytes and Gymnosperms, their relationship toAngiospermic plants	K2
CO2	Classify different fossil types based on the age of fossils *and assess* scientific perspective of *significant fossils*	K3, K4
CO3	Analyze the medicinal and economical utility of many ferns and gymnosperm species	K4
CO4	Recommend the *in situ and ex situ* conservation of Pteridophytes and Gymnosperms for future research needs	K3
CO5	Plan a fernery and nursery production of Pteridophytes and Gymnosperms at small or large scale to uplift their economy	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(15 hrs.)**

Pteridophytes-Classification of Pteridophytes (Reimer's, 1954) - Apospory – Apogamy - Morphology - anatomy and reproduction of - Psilotales -Selaginellales – Isoetales – Marattiales

UNIT II **(15 hrs.)**

Morphology - anatomy and reproduction of – Ophioglossales – Osmundales–Filicales(19 Families)– Salviniales - Sorus evolution

UNIT III **(15 hrs.)**

Gymnosperms -Classification of Gymnosperms (Sporne, 1965), General account of Bennettitales (Williamsoniaceae, Wielandiellaceae, Cycadeoideaceae)–Pentoxylales (Pentoxylaceae)-Cycadales(Cycadaceae, Nilssoniaceae) – Taxales(Taxaceae)

UNIT IV **(15 hrs.)**

General account of Coniferales (Cupressaceae – Podocarpaceae – Araucariaceae - Pinaceae) - Ginkgoales (Trichopityaceae, Ginkgoaceae) – Gnetales (Gnetaceae, Welwitschiaceae, Ephedraceae)-Angiospermic characters

UNIT V **(15 hrs.)**

Palaeobotany -Types of fossils- Process of fossilization and importance of fossils –Detailed study of the fossil forms – Pteridophytes - Rhynia- Lepidodendron – Calamites – Sphenophyllum– Gymnosperms - Lyginopteris - Cordaites

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Rashid.A.	An Introduction to Pteridophyta	Vikas publications, New Delhi	1999, 2nd Edition
2.	Vasishta,P.C.,Sinha,A. Anilkumar, K.	Gymnosperms	S.Chand&Company Pvt Lt.	2006, Revised Edition
3.	Arnold,A,C	An introduction to Palaeobotany	Agrobios (India), Jodhpur	2007, Revised Edition
4.	Vasishta,P.C.,Sinha,A.K Anil Kumar	Pteridophyta	S.Chand&Company Pvt Lt.	2005, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Sporne, K.R.	The Morphology of Pteridophytes,	Hutchinsonand Co., London	1975, 2nd Edition
2.	Verma,H.K.	Pteridophyta	Random Publisher	2011, 1st Edition

Web Resource

www.biologydiscussion.com/gymnosperm/gymnosperms-classification-and...

https://www.toppr.com/guides/biology/plant-kingdom/gymnosperms/

https://courses.lumenlearning.com/wm.../sexual-reproduction-in-gymnosperms/

www.peoi.org/Courses/Coursesen/bot/temp/bot17t108.html

https://link.springer.com/chapter/10.1007/978-3-642-50133-3_9

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar,Field visit

SEMESTER I

CODE	COURSE TITLE
18BOPC104	ANATOMY AND EMBRYOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To study Histological and Anatomical tools for identification of plants

To understand the anomaly existing in angiosperm plants

To study the developmental stages in Angiosperms embryos and abnormal embryos

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the hierarchy of plant structure by learning the basic features of plant cells, tissues, and organs and function of various tissues and exposure to evolutionary interpretations of anatomical homology	K2,K3
CO2	Interpret the basic pattern of plant growth from different kinds of meristems and analyse the relationships between primary growth and secondary growth of naturally occurring plant assemblages and compare structural differences among different taxa	K2,K3,K4
CO3	Distinguish connections between plant anatomy and the other major disciplines of biology, including taxonomy, cell biology, physiology, genetics, biochemistry, and ecology and make sense in light of evolution	K4
CO4	Attain knowledge and assess formation of developmental cycles, regulation of the flowering process and embryo formation	K5
CO5	Apply technical and histochemical skills in the identification of plants	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	M
CO2	S	M	S	S	M
CO3	S	S	S	M	M
CO4	S	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT-I **(15 hrs.)**

Anatomy-Tissues- Meristem – Types- Shoot apex- Root apex and theories Vascular cambium – origin – types – structure and Functions – Phylogenetic trends of specialization of xylem and phloem. Secondary xylem and Secondary phloem -Epidermis – Types, wall structure

UNIT-II **(15 hrs.)**

Stomata– epidermal appendages – Periderm - Leaf Histology – ontogeny – Development of Dicot and Monocot Leaves – Leaf Abscission- Nodal Anatomy. Outline of floral vasculature, Anatomy in relation to Taxonomy

UNIT-III **(15 hrs.)**

Anomalous secondary thickening - Bignoniaceae – Amarantaceae – Aristolochiaceae - Nyctaginaceae andPiperaceae – Arborescent monocots

UNIT-IV **(15 hrs.)**

Embryology- Anther – Morphology,developement - Tapetum– ultra structure- types and functions. Male gametophyte- development. Female Gametophyte – Types- ultra structure – development – Synergids- Nutrition of embryo sac - fertilization and double fertilization

UNIT-V **(15 hrs.)**

Endosperm – Types and development. Endosperm haustoria – function - storage metabolites- Embryo – Development of a Monocot and Dicot embryo – Polyembryony- Apomixis and Parthenocarpy

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Katherine Esau	Anatomy of seed plants	Graw Hill Book Co. Inc., New York,	1958, 1st Edition
2.	C.R.Metcalfe&L.Chalk	Anatomy of the dicotyledonsvol-II	Clarendon press Oxford	1985, 1st Edition
3.	Sharma,H.P.	Plant Embryology	Narosa Publishing House	1977, 1st Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Fahn.A	Plant Anatomy	Pergamon Press Newyork	2010, 3rd Edition
2.	Bhojwani, S.S Bhatnagar,S.P and Dantu,P.K.	Embryology of Angiosperm	Vikas Publishing House	2009, 6th Edition

Web Resource

www.biologydiscussion.com/plant-taxonomy/modern...relation-to-taxonomy/47665
https://www.plantscience4u.com/2015/06/anomalous-secondary-thickening-in.html
www.biologydiscussion.com/botany/nodal-anatomy-of-plants-with.../20364
www.yourarticlelibrary.com/difference/...fertilization-and-double-fertilization.../1165...
https://hemantmore.org.in/foundation/science/biology/endosperm/2441/

Pedagogy

Lecture-Chalk & Talk,PPT, Quiz, Assignment, Group Discussion, Seminar,Microtechnique

SEMESTER I

CODE	COURSE TITLE
18BOPN101	VALUE ADDED PLANT SCIENCE

Category	CIA	ESE	L	T	P	Credit
Non Major Elective	25	75	40	5	-	5

Preamble

To enable the non-science major students to have basic knowledge on plant science.

To develop entrepreneurial skill and health awareness using herbs

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain different types of gardening and construct framing of gardens	K3
CO2	Gain knowledge on plant resources as medicine and develop social responsibilities to conserve medicinal plants	K1,K5
CO3	Develop skills on plant propagation techniques	K5
CO4	Applyand analyse the skills and techniques to produce biofertilizers to become potential entrepreneurs	K3,K4
CO5	Establish Cultivation of mushrooms, Spirullina and vermicompost for self-employment opportunities	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	M	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(9 hrs.)**

Gardening - Garden styles, Kitchen garden - Roof garden - Miniature water garden - Rockery and Hanging basket

UNIT II **(9 hrs.)**

Asexual Propagation& Flower arrangement - Types of asexual propagation: Layering – Grafting. Hydroponics –Bonsai - Flower arrangement

UNIT III **(9 hrs.)**

Single cell protein - Cultivation and Nutritive value - Spirulina - Yeast - Mushroom cultivation and Nutritive values – Oyster mushroom - White button mushroom

UNIT IV **(9 hrs.)**

Biofertilizer - Rhizobium - mass cultivation and uses. Vermicomposting - Study of Earth worm (Eisenia and Lampito). Preparation of Vermicomposting. Vermiwash Production techniques. Role of vermicompost in agriculture

UNIT V **(9 hrs.)**

Nutraceuticals- Food as medicine- Preparation of Home medicines – Tulsi water mango pickles– Hibiscus syrup, Arugampuljuice.jam,jelly preparation

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Sathe,T.V.	Vermiculture and Organic farming	Taya Publishers, New Delhi	2004, 1st Edition
2.	Panda, H.	The Complete technology books on herbal Beauty with formulations & Process	Asia pacific Business press. Inc., New Delhi	2015, 1st Edition
3.	Marilyn Barrett	The Hand Book of clinically tested Herbal Remedies	CBS Publishers,	2007, 1st Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Chattopadhyay, P.K.	Herbal Cosmetics and Ayurvedic medicines	National Institute of Industrial Research, New Delhi	2013, 3rd Edition
2.	Chada,K.L.,Singh, A.K.,Patel,V.B.	Horticulture to Hortibusiness	Westville Publishing House	2011, 1st Edition

Web Source

https://www.gardendesign.com/pictures/vegetable-roof-garden_473/

https://www.growthtechnology.com/growtorial/what-is-hydroponic-growing/

https://www.sceltamushrooms.com/cultivation-and-harvesting

https://www.researchgate.net/.../235545341_Role_of_vermicompost_in_sustainable_a..

https://www.motherearthnews.com/.../make-your-own-herbal-medicines-zmaz04jjzsel

Pedagogy

Lecture- Chalk& Talk, PPT, Quiz, Assignment, Seminar,Nurseryvisit,Industrialvisit,Visit to Pharma Laboratory

SEMESTER II

CODE	COURSE TITLE					
18BOPC205	CELL BIOLOGY AND PLANT TISSUE CULTURE					
Category	**CIA**	**ESE**	**L**	**T**	**P**	**Credit**
Core	25	75	85	5	-	4

Preamble

To comprehend the structure of cell organelles and structure and replication of nucleic acid
To develop the skill of in *vitro* propagation and its applications in Agriculture, horticulture and forestry

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and manipulate the structures and function of basic components of eukaryotic cells, especially macromolecules, membranes, and organelles	K2, K3
CO2	Infer the cellular components underlying mitotic cell division	K4
CO3	Describe the structure, composition and role of DNA and RNA.and evaluate role of fundamental processes of replication and repair mechanism	K2, K5
CO4	Analyse the tasks relevant to cell culture (preparation of media, inoculation, recovery, and assessment of cell growth)	K4
CO5	Acquire and focus the skills in tissue culture with requirements for different plants and recognize troubleshoot problems during culture	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	S	S
CO3	S	S	M	S	S
CO4	S	S	M	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT- I **(18 hrs.)**

Cell Biology-Cell Organelles- Cell-ultra structure - Cytoplasmic organelles - origin-structure and function of Mitochondria-Golgi apparatus- Plastids- Ribosome- Dictyosome- Glyoxysome and Peroxisome

UNIT- II **(18 hrs.)**

Plasma membrane- Ultra Structure and functions- Cell wall- primary- secondary and tertiary at microscopic and submicroscopic levels- Chemistry of cell wall- Structure and functions of nucleus-nuclear envelope andnucleolus- Chromosomes – ultra structure and function, specialiszed chromosomes-polytene and lamp brush

UNIT- III **(18 hrs.)**

Cell divisions- Mitosis- mitotic apparatus and its significance-Meiosis and its significance- DNA – Structure (Watson and Crick model) - replication - termination of replication -Role of Enzymes in DNA replication - Methylation and Repair mechanism -Types of DNA - Mitochondrial and chloroplast DNA- Types and synthesis of RNA

UNIT- IV **(18 hrs.)**

Plant Tissue culture - Concepts and Applications – (Preparation of media- sterilization – inoculation – incubation – regeneration - hardening and plantlet transfer) Type of cultures – callus and suspension culture Meristem culture, Protoplast isolation and culture - Hybrids and Cybrids- Somatic hybridization

UNIT- V **(18 hrs.)**

Somaclonal variation- Somatic embryogenesis- Haploid production- and Embryo culture-Synthetic seed -Cryopreservation-Application of tissue culture in Agriculture- Horticulture and Forestry

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Satyanarayana,U.	Biotechnology	Books and allied Pvt.Ltd. Kolkata	2005,1st Edition
2.	Razdon, M.K.	Introduction to plant tissue culture	Oxford IBH Publishing co. PVT., LTD New Delhi	2003, 2nd Edition
3.	Dubey,R.C.	Text book of Biotechnology	S.Chand& Company Ltd. Ram Nagar,New Delhi	2009, 6th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Freifelder, D.	Molecular Biology	Narosa publishing house, New Delhi	1990, 2nd Edition
2.	Gupta,M.L.,Jangir,M.L.	Cell Biology	Agrobios India	2012, 1st Edition
3.	De Robertis, E.D. P., Wiktor, W. Nowinski& Francisco A. Saez "W.B.	Cell Biology	Saunders Company, London and Toppon Company Ltd., Japan	1913, 5th Edition

Web Resource

https://en.wikipedia.org/wiki/Organelle

https://biology.tutorvista.com/cell/chromosomes.html

https://www.atdbio.com/content/15/Mutagenesis-and-DNA-repair

https://www.britannica.com/science/tissue-culture

www.cryogenetics.com/products-and-services/cryopreservation/

Pedagogy

Lecture- Chalk& Talk, PPT, Quiz, Assignment, Seminar, Group Discussion, Seminar,Animation,Videos

SEMESTER II

CODE	COURSE TITLE
18BOPC206	GENETICS, GERMPLASM CONSERVATION AND PLANT BREEDING

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To discern the genetical disorders in life forms

To understand the regulation of gene expression

To know the hybridization methods and techniques in crop plants

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain and compare the interaction of genes, sex linked inheritance and sex determination	K2 , K4
CO2	Recall and interpret the modern concept of genes,gene frequency and genetic drift	K3
CO3	Conclude the regulation of gene expression in prokaryotes, eukaryotes and synthesis of genes	K5
CO4	Analyse the strategies and methods in germplasm conservation	K4
CO5	Apply the breeding methods and techniques in crop plants to promote entrepreneurial skills	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT-I **(18hrs.)**

Genetics -Interaction of genes –out line of Mendelian laws-Mono and Dihybrid Cross- Lethal factors- Modifying factors- Collaborative factors. Co dominance - Quantitative inheritance - sex determination in plants- Theories of sex determination (theory of Heterogametic&Genic balance)-Sex linked inheritance in man- Sex influenced characters

UNIT-II **(18hrs.)**

Gene mutation - Detection of mutation (CLB Method - Muller 5 method). Physicaland chemical mutagens and their mode of action. Eugenics- Euthenics- genetic disorder of chromosomal and genic origin. Extrachromosomal inheritance - Uniparental inheritance in Chlamydomonas and Yeast-Male sterility in Maize

UNIT- III **(18hrs.)**

Population genetics – gene frequency –Hardy Weinberg law, Genetic drift-Modern concept of genes- Structure of gene-IS Element and Transposons- Regulation of gene expression in Prokaryotes and Eukaryotes Artificial synthesis of gene

UNIT -IV **(18hrs.)**

Germplasm conservation- World diminishing plant resources-Threatened and endangered plants- Red Data Books- The role of IBPGR and NBPGR in Germplasm Conservation - Intellectual Property Rights (IPR)

UNIT- V **(18hrs.)**

Plant breeding – Objectives, selection, breeding methods in self-fertilized - cross fertilized and vegetatively propagated plants- Breeding plants for improving yield, hybridization and quality and resistant to diseases- Role of polyploidy in Crop improvement

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Singh, B.D.	Genetics	Kalyani Publishers	2009, 4th Revised Edition
2.	Verma P. S. and Agarwal , V.K.	Genetics	S. Chand & Co, New Delhi	2010, Revised Edition
3.	Arnold, R.W.	Principles of Plant Breeding	John Willey & Sons	1983,1th Revised

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	S.S.Purohit	Genetics	Agrobios India	2011,1st Edtion
2.	Singh, B.D.	Plant Breeding: Principles and Methods	Kalyani Publishers	2009. 4th Revised Edition

Web Resource

www.yourarticlelibrary.com/essay/biology...on...linked-inheritance...human.../41778

https://ghr.nlm.nih.gov/primer/mutationsanddisorders/genemutation

www.biologydiscussion.com/gene/modern-concept-of-gene-with-diagram.../

https://www.epa.gov/endangered-species/learn-more-about-threatened-and-endangere...

https://www.researchgate.net/.../239923275_Polyploidy_and_Crop_Improvement

Pedagogy

Lecture- Chalk& Talk, PPT, Quiz, Assignment, Seminar, Group Discussion, Seminar,Animation,Videos

SEMESTER II

CODE	COURSE TITLE
18BOPE201	MICROBES AND INDUSTRY

Category	CIA	ESE	L	T	P	Credit
Elective	25	75	85	5	-	4

Preamble

To study the Classification, Characteristics & Structure of industrially important microbes

To study the isolation, Identification & Production of potential microbes in industries

To develop the skill of manufacturing industrial products

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the structure and characteristics of microbes and analyse culture methods and measurement of bacteria	K2, K4
CO2	Acquire knowledge on the structure and reproduction and distinguish plant, animal and human virus	K2, K4
CO3	Develop skills on fermentation, screening and detection techniques for industrial products	K5
CO4	Identify, isolate and produce potential microbes used in industry	K3
CO5	Invent the microbial flora for soil fertility and to purify fresh water bodies	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	M	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT - I (18 hrs.)

Bacteria - Classification of Bacteria (Bergey's, 1923) – Morphology and Ultra structure – Bacterial culture and cultural characteristics – Isolation and maintenance of pure culture – Growth curve of bacterial population - Quantitative measurement of bacterial growth – Economic importance of bacteria.

UNIT - II (18 hrs.)

Viruses - Classification (Harrison et al., 1971) – Plant Virus – Classification of plant virus- Double strandard RNA and DNA viruses - Cauliflower Mosaic Virus – Wound Tumour Virus – Bacteriophages

–Types of phages- Ss DNA Phages- Ds DNA Phages - Ss RNA Phages - DsRNAPhages-Morphology – structure and replication T2 and T4 phages.

UNIT - III **(18 hrs.)**

Industrial microbiology - Scope of industrial microbiology - Development of industrial fermentation process – Screening - Detection and assay of fermentation products - Stock culture - Fermentation media - Inoculum preparation- Scale up of fermentations - Increasing product yield.

UNIT-IV **(18 hrs.)**

Fermentation techniques – Types of Fermentation – Importance of microbial enzymes in industry – Industrial production of cellulolytic enzymes – Penicillin – Glutamic acid – Citric acid and Vitamin B12.

UNIT-V **(18 hrs.)**

Microbiology of soil and water – Rhizosphere and Mycorrhizae – factors affecting microbial community in soil. Types of water – Fresh water microbiology – Purification of water.

Text Books

SL.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	J.M.Willey, L.M.Sherwood C.J.Woolverton	Prescotts Microbiology -	McGraw- Hill, Publisher	2012, 8 th Edition.
2.	Patel, A.H.	Industrial Microbiology	Macmillan	2012, 2nd Edition
3.	Saravanan P.	Virology	MJP Publishers	2006,1st Edition
4.	Pawar and Daginawala	General Microbiology	Himalaya Publishing House	1992, 8th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Pelczer, M.J. (Jr.)., Chan, E.C.S. andKreig, N.R.	Microbiology	Tata McGraw- Hill, New Delhi	1995, 3rd Edition
2.	Casida, L.E.	Industrial Microbiology	Wiley Eastern Ltd., New Delhi	1968, 1st Edition.

Web Resource

https://graduatenotes.blogspot.com/2011/11/bergey-classification-of-bacteria.html
www.biologydiscussion.com/viruses/bacteriophages-meaning-morphology.../34281
www.mitconbiopharma.com/wp-content/uploads/2015/08/Fermentation-3.pptx
https://www.scribd.com/document/72527157/Industrial-Production-of-Penicillin
https://www.wiley.com/.../Freshwater+Microbiology%3A+Biodiversity+and+Dynamic...

Pedagogy

Lecture- Chalk& Talk, PPT, Quiz, Assignment, Seminar, Group Discussion, Seminar,Industrial visit

SEMESTER II

CODE	COURSE TITLE
18BOPS201	ADVANCED MULTI SKILL DEVELOPMENT PAPER

Category	CIA	ESE	L	T	P	Credit
SBS	40	60	42	3	-	5

Preamble

To prepare students for lifelong productive careers which include graduate studies, communication professions or corporate leadership

To familiarize the students with various types of tests that is employed by the diverse examining bodies

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply key concepts of self development and management to enhance personality	K3
CO2	Discover solutions for real-life problems requiring interpretation and comparison of various representations of numerical data	K4
CO3	Develop a logical framework for the critical analysis of spoken, written, visual and mediated messages in a diverse environment	K6
CO4	Prioritize importance of professional development by pursing higher education in research or facing interviews in various institutions that often challenging in plant science	K4
CO5	Integrate the scientific current techniques and concept with the support of Computer based skills	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	S	M	S	S
CO3	S	M	S	S	M

CO4	S	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT -I **(9 hrs.)**

Communication- Question tags - Gerund and Infinitives - Spotting the errors – Synonyms – Antonyms - One word substitution – Sentence completion – Prepositions – Articles.

General Awareness and Scientific Aptitude: Socio - Economic - Banking – Basic Sciences

People and Environment

Politics and Current Affairs

Higher Education

Information and Communication Technology

Teaching Aptitude

Research Aptitude

UNIT- II **(9 hrs.)**

Logical Reasoning : Syllogism – Statement Conclusions – Statement Arguments – Statement Assumptions – Statement Courses of Action – Inference – Cause and Effect – Visual Reasoning – Direction Sense Test – Blood Relation – Coding and Decoding – Deductive Reasoning.

UNIT- III **(9 hrs.)**

Numerical Reasoning and Quantitative Aptitude**:** Age – speed – Heights and Distance – Time and Distance - Ratio and Proportion – Percentage – Fraction – Profit and Loss – Interest – Average – Calendar – Clocks– Probability – Series – Venn Diagram - Data Interpretation.

UNIT -IV **(9 hrs.)**

Power point presentation – Meiosis- Mutation- Grafting- Layering- *Ex-situ* Conservation- *In–situ* Conservation- Green house effect- Global warming and Acid rain.

UNIT- V **(9 hrs.)**

Interview types –One to one- one to panel- Interview skills-Verbal- Greeting- Speaking.

Non –Verbal –movement- posture- gesture- eye contact- Voice modulation- Dress code- Space and proximity

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Tara Chand,K.	General Studies for Civil Services Preliminary Examinations	Paper – I, Tata McGraw Hill Education Private Ltd	2013,2nd Edition
2.	Hari Mohan Prasad and Uma Rani Sinha.	Objective English for Competitive Examinations. New Delhi	Tata McGraw Hill Education Private Ltd	2011,1st Edition
3.	Agarwal,R.S,	Quantitative Aptitude,	S. Chand and Company	2012, Reprint

4.	Datason, R.P, Manish Arora and Gulati.SW.L,	Clerical Cadre Recruitment in State Bank of India,	Newlight Publishers,	2013, 2nd Edition
5.	Lal, Jain and Vashishtha, K.C	UGC NET/JRF/SET Teaching and Research Aptitude	UpkarPrakashan Publishers	2012.3rd Edition

Web Resource

https://www.indiabix.com/general-knowledge/general-science

www.basictell.com/general-knowledge_questions-answers_environment-science-1

www.psychometric-success.com/aptitude-tests/numerical-aptitude-tests.htm

https://www.jagranjosh.com/.../quantitative-aptitude-and-numerical-ability-whats-the-.

https://www.fresherslive.com › Online Test

www.theonlinetestcentre.com/logical-reasoning.html

Pedagogy

Lecture- PPT,Quiz, Group Discussion, Seminar,Lecture Workshop

SEMESTER II
PRACTICALS

CODE	COURSE TITLE
18BOPCP01	PHYCOLOGY, BRYOLOGY AND LICHENOLOGY, MYCOLOGY AND PHYTOPATHOLOGY AND CELL BIOLOGY AND TISSUE CULTURE

Preamble

Category	CIA	ESE	L	T	P	Credit
Core Practical - I	40	60	-	-	90	3

To appreciate and analyse the diversity of plants and microbes on earth

To develop the skills of micro preparations

To estimate the pigments in healthy and infected plants and acquire knowledge on pathological process of plants

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire analytical skills to attain significant mile stone in the field of Algae; Bryophytes and Lichens	K2
CO2	Apply and interpret with curiosity and creativity on Lower plants using histological studies	K4
CO3	Recall certain morphological attributes of diverse forms of plants and pathological processes that are distinct in plants	K2
CO4	Understand to select , apply and adopt appropriate techniques in the production of industrially useful Fungi	K2 , K3
CO5	Develop and apply the skills of *in-vitro* regeneration technique on plants	K3, K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	S	M	S
CO3	S	S	S	M	M
CO4	S	M	S	M	M
CO5	S	S	S	S	**S**

S- Strong; M-Medium; L-Low

Syllabus

PHYCOLOGY, BRYOLOGY AND LICHENOLOGY

Phycology: Gonium - Pediastrum – Hydrodictyon- Ulva - Bulbochaete – Cladophora - Pithophora –Stigeoclonium – Draparnaldia – Trentepohlia - Zygnema – Closterium – Nitella - Pinnularia – Sargassum - Padina – Turbenaria – Batrachospermum – Ceramium – Amphiroa - Gracillaria and Gelidium – Oscillatoria - Gloeocapsa – Lyngbya.

Bryology: Riccia - Targionia - Lunularia – Reboulia – Dumortiera - Aneura - Sphagnum and Bryum.

Lichenology:Parmelia, Usnea

MYCOLOGY AND PHYTOPATHOLOGY

Mycology :Albugo – Saprolegnia – Rhizopus - Mucor – Saccharomyces – Ascobolus – Pezzia - Puccinia - Agaricus – Polyporus-Lycoperdon-Alternaria-Fusarium-Cercospora

Phytopathology:

1. Estimation of total chlorophyll in infected and healthy plants.
2. Causal agent, symptoms and control measures of Black wart of Potato, little leaf of Brinjal, Blight of Paddyand Virus diseases of Potato.
3. Comparison between infected and healthy plants with reference to total carbohydrate and Protein.

CELL BIOLOGY AND TISSUE CULTURE

Cell biology

1. Study of meiosis using smears - Individual
2. Interpretation of micrographs from standard purchased materials or from transparencies.

Tissue Culture

Preparation of stock solution- sterilization- inoculation- nutrient media- organ culture- Morphogenesis- Induction of callus- Group Practical

Synthetic seed preparation - Individual

SEMESTER II

CODE	COURSE TITLE
18BOPCP02	PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY , ANATOMY AND EMBRYOLOGY AND GENETICS, GERMPLASM CONSERVATION AND PLANT BREEDING

Category	CIA	ESE	L	T	P	Credit
Core Practical - II	40	60	-	-	120	3

Preamble

To develop skills on micro preparations and dissection of embryos

To apply the skills of breeding and conservation techniques to crop plants

To understand the systematic way to solve interaction of genes

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on embryological development and interaction of genes to predict morphological features	K2
CO2	Understand and evaluate the phylogenetic relationships between the fossils and present day plants	K2,K3
CO3	Use appropriate knowledge and develop skills to identify plants using salient features and anatomical variations	K3
CO4	Analyse and apply the skills in the conservation of plant diversity	K3
CO5	Apply the breeding methods and techniques to cultivate crop plants	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	**M**
CO2	S	M	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	**S**

S- Strong; M-Medium; L-Low

Syllabus

PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

Pteridophytes:Psilotum- Selaginella – Angiopteris – Osmunda – Dicranopteris – Lygodium – Pteris – Alsophila – Nephrolepis - Salvinia and Azolla.

Gymnosperms: Pinus, Gnetum, Cupressus – Podocarpus – Araucaria - Ephedra.

Fossils: Rhynia – Lepidodendron ,Stigmaria, Sphenophyllum – Calamites.

Gymnosperms: Lyginopteris- Lagenostoma - Pentoxylon – Cordaites.

ANATOMY AND EMBRYOLOGY

Anatomy

Study of anatomical features with the help of section – peelings and macerations included in the syllabus

Embryology

With the help of permanent slides/book diagrams to study

1. Stages in development of micro sporangium and male gametophyte
2. Configuration of ovules 2, 4, nucleateembryosac, mature embryosac
3. Types of endosperm
4. Stages in embryogeny globular, proembryo matured embryo of Dicot (dissection)
5. Pollen germinability

GENETICS, GERMPLASM CONSERVATION AND PLANT BREEDING

Solving Problems involving:

1. Interactions of factors
2. Sex linked inheritance
3. Quantitative inheritance
4. Calculation of gene frequencies
5. Training in hybridization techniques

Components of CIA Marks(Theory)

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
10	5	10	25

Components of CIA Marks (Practicals)

Tests (I & II)	Record	Performance	Model Examination	Total
10	5	15	10	40

CIA

Bloom's Category	Section	Choice	Marks	Total
K2	A	Compulsory	2 x 2 = 4	30
K3, K4	B	Either / Or	2 x 5 = 10	
K4, K5	C	Either / Or	2 x 8 = 16	

Model and End Semester Examination

Bloom's Category	Section	Choice	Marks	Total
K2	A	Compulsory	5 x 2 = 10	75
K3, K4	B	Either / Or	5 x 5 = 25	
K4, K5	C	Either / Or	5 x 8 = 40	

NON MAJOR ELECTIVE

Components of CIA

Test - 10 Marks Assignment / Seminar / Subject Viva - 5 Marks

Model Examination- 10Marks Total - 25 Marks

Section	Choice	Marks	Total
	Open Choice (5 out of 8)	5 x 15	75

SELF LEARNING PAPER - I
WEALTH FROM WASTES

Max. Marks: ESE - 100 **Sub.Code: 13BOPSL02**

Credit: 5

Objectives:

Gaining momentum in the millennium by utilizing the available wastes and channel them towards economic activities.

UNIT I

Organic wastes – Compost making – Different methods, sources of Biogas generation (Animal, Human, Agriculture, Aquatic & Industrial wastes).

UNIT II

Biomedical wastes – Sources, types, Disposal methods, segregation, Recycling – composting, Incineration.

UNIT III

Coir wastes in Agriculture – Coir waste compost – Composition, Coirwaste briquetting, application of briquetting. Coirwaste in Poultry and Crop Production, Coir waste as mulch and rooting medium.

UNIT IV

Agricultural wastes – Paper manufacturing – Kinds of agricultural wastes, operations in paper and paper board making. Sugarcane wastes – Pressmud – Bioearth, Sugarcane trash composting, creating art objects, Mushroom cultivation.

UNIT V

Sewage water – Utilization sewage water, sewage treatment, Treatment of Effluent – Paper mill, Distillery, Vermi Composting.

References:

1. **Asthana, D.K. and Meera Asthana,** *"Environment Problems and Solutions",* S.Chand and Company Ltd. First Edition, 2002.

2. **Dubey, R.C.,** *"A text book of Biotechnology",* S. Chand and Company,2001.

3. **Kumaresan, V.**,*"Biotechnology",* Saras Publication, Chennai, 2005.

4. **Narayana Rao, M.** and **Amal K. Dutta,** *"Waste water treatment"*, Oxford IBH Publishing Co. Pvt. Ltd. New Delhi, second edition, 2003.

5. **Palaniappan, S.P. and K. Annadurai,** *"Organic farming theory and practice",* Scientific Publiucations, Jodhpur, India. 2003.

6. **Sakharkar, B.M.,** *"Principles of Hospital Administration and Planning",* First Edition, Published by Jaype Brothers, 2003.

7. **Sathe, T.V.**,*"Vermiculture and Organic farming"*, Daya Publishing house, New Delhi, 2004.

SEMESTER III

CODE	COURSE TITLE
18BOPC307	TAXONOMY AND BIOSYSTEMATICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To conserve the biodiversity.

To identify the locally available plants.

To understand the relationship of Taxonomy with other fields of Biological science.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe and classify plant diversity and understand the major features and evolutionary origins of vascular plants.	K1,K2
CO2	Learn the vocabulary of plant description and identify the plants using dichotomous keys	K3
CO3	Be aware of the importance of taxonomic relationships in plant systematics and to understand the causes for selection and variation in plant characteristics	K3, K4
CO4	Recognize some important angiosperm families and gain knowledge of their diagnostic characters	K3
CO5	Understand the systematics, diagnostic characters and to know where the food plants come from	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	M	M	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT- I **(15hrs.)**

Major Systems of classification- Artificial – Linnaeus - Natural – Bentham and Hooker Phylogenetic – Engler and Prantl – Outline of APG –III Plant classification - Hierarchy of characters in Plant Taxonomy-Species- Genus- Family and other categories- concept of species and intraspecific categories-subspecies- varieties and forms.

UNIT- II **(15hrs.)**

Plant Nomenclature-ICBN with reference to IAPT- Typification - Principles of priority and their limitations. Effective and valid publications - citation-retention - choice and rejection of names – Taxonomic literature- Flora-Monograph - Revision – Key- Indented- Bracketed- Botanical Gardens.

UNIT- III **(15hrs.)**

Taxonomic evidences- External morphology - Anatomy-Embryology-Palynology- Cytology-Modern trends in Taxonomy- Chemotaxonomy- Numerical taxonomy-Molecular taxonomy-Biosystematics-Phenotypic plasticity- Turreson's experiment.

UNIT-IV **(15hrs.)**

Polypetalae - Systematics– Diagnostic characters and economic uses of the following families-Menispermaceae – Polygalaceae – Caryophyllaceae – Meliaceae –Vitaceae – Rhamnaceae – Sapindaceae - Fabaceae – Rosaceae – Combretaceae - Onagraceae –Lythraceae- Aizoaceae.

UNIT-V **(15hrs.)**

Gamopetalae - Oleaceae – Gentianaceae – Apocynaceae - Solanaceae– Boraginaceae – Bignoniaceae – Pedaliaceae–Monochlamydeae- Nyctaginaceae – Aristolochiaceae - Loranthaceae–Monocotyledons- Scitamineae- Commelinaceae - Aroideae –Cyperaceae.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Taxonomy of Angiosperms	Pandey S.N and Misra S.P.	Anne Books, India	2008, Revised Edition
2.	Plant Taxonomy	Saxena N.B. and ShamindraSaxena	Pragati Prakashan , India	2001 3rd Edition
3.	Taxonomy of Angiosperms	Singh V.K. and Jain,D.K	Rastogi Publications	2012, 8th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Lawrence H.M.	Taxonomy of Vascular plants	Mac Millan& Co	1979, 1st Edition
2.	Heslop J. Harrison	New concepts in flowering plants taxonomy	Heinemann EducationalBooks, India	1970, Revised Edition
3.	Davis P.H. and HeywoodV.H.D.	Principles of Angiosperm Taxonomy	Oliver and Boyd, London	1963, 1st Edition

Web Resource

www.biologydiscussion.com/plants/classifications/system-of...classification-3.../30330
www.biologydiscussion.com/.../plant-nomenclature/essay...nomenclature...plants.../77.
https://www.slideshare.net/nasira55/evidences-of-anatomy-cytology-and-chemistry-to-plant-taxonomy
https://en.wikipedia.org/wiki/Polypetalae
https://en.wikipedia.org/wiki/Gamopetalae
https://en.wikipedia.org/wiki/Monochlamydeae
https://en.wikipedia.org/wiki/Monocotyledon

Pedagogy

Lecture- Chalk & Talk, PPT, Quiz, Assignment, Seminar, Plant collection, Micro preparation Herbarium Techniques, Field visit.

SEMESTER III

CODE	COURSE TITLE
18BOPC308	PLANT PHYSIOLOGY AND PHYTOCHEMISTRY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To understand the movement of water and solute.

To learn the metabolic and biochemical reactions in plants.

To understand the mechanism of organic matter production.

To study the role of metabolites and growth hormones in physiological effects.

To understand the interactions among the cells, tissues and organs within a plant

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on physiological processes between plants and their environment	K1
CO2	Understand and analyse the metabolic and physiological process unique to plants	K2,K3
CO3	Understand physiological mechanisms of plants and to apply for crop improvement	K3, K4
CO4	Develop entrepreneurial skills in using the hormones on plant propagation	K4
CO5	Understand the functions of molecules and metabolites which serves as the foundation for advances in agriculture, horticulture and forestry	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **18Hrs.**

Water – Properties, Biological significance – Water relationships of the plants -Water potential. Absorption of water- Ascent of sap, Absorption of solutes – Translocation of solutes - Translocation of assimilates**.** Transpiration - Kinds of transpiration, Mechanism of stomatal transpiration - factors affecting transpiration.

UNIT II **18 Hrs.**

Photosynthesis- Photosynthetic pigments- Mechanism of Photosynthesis: Light reaction - Electron carriers- photophosphorylation - Carbon fixation in C_3 and C_4 plants- CAM pathway. Photorespiration and glycolate- metabolism.

UNIT III **18 Hrs.**

Respiration- Aerobic and anaerobic respiration -Glycolysis - Pyruvate metabolism. TCA cycle- Electron transport system coupled with Oxidative phosphorylation- Metabolism of storage protein – Gluconeogenesis - fat to carbohydrates - HMP pathway**.**

UNIT IV **18 Hrs.**

Phytochemistry- Enzyme: Classification, Properties and mechanism of enzyme action, factors affecting enzyme activity- Growth hormones-General account of Auxin- Gibberellins- Cytokinins- Ethylene - Abscissic acid- Senescence- Phytochrome- Photoperiodism- Vernalisation- Circadian rhythm and Biological clock.

UNIT V **18 Hrs.**

Phytochemistry – Classification, structure and properties of carbohydrates- amino acids- proteins - lipids - Secondary metabolites - Classification, role of Terpenoids, Alkaloids, Polyphenolics, Biosynthesis of secondary metabolites- Free radicals : Types, causes of free radicals- General account on antioxidant activity.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Jain, J.L	Fundamentals of Biochemistry	S. Chand and Company PVT., LTD., New Delhi	2002, 7th Edition
2.	Robert M. Devlin and Francis H. William,	Plant Physiology	CBS Publishers & Distributors, New Delhi	1972,4th Edition
3.	Meirion Thomas,S., Ranson and RichardsonJ.A.	Plant Physiology	Longman group limited, London.	1973, 5th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Albert L. Lehninger	Principles of Biochemistry	CBS Publishers & Distributors, PVT Ltd., New Delhi.	1987, 4th Edition
2.	Frank B. Salisbury and Cleon W. Ross	Plant Physiology	CBS Publishers, New Delhi.	1974, 9th Edition
3.	Geoffrey Zubay	Biochemistry	Addison Wesley Publishing Company, Sydney.	1984, 4th Edition

Web Resource

https://www.google.com/search?q=water+relation+in+plant+physiology

https://www.google.com/search?q=photosynthesis+in+plants

https://www.google.com/search?q=respiration+in+plants

https://www.google.com/search?q=respiration+in+plants

https://www.google.com/search?q=secondary+metabolites+in+plants

https://www.google.com/search?q=primary+metabolites+in+plants

Pedagogy

Lecture- Chalk & Talk, PPT, Quiz, Assignment, Seminar, Physiological experiments and phytochemical analysis

SEMESTER III

CODE	COURSE TITLE
18BOPC309	BIOINFORMATICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To understand the current concepts in gene organization, transcription, translation and regulation of gene

To analyze the structure and sequence of biomolecules using new technology

To develop the skill for analyzing various software applications

To understand the importance of bioinformatics tools and apply it in life science research

Course Outcomes

On the successful completion of the course, students will be able to

CO s	CO Statement	Knowledge Level
CO1	Acquire knowledge on different computational tools to find DNA sequences and to predict genes	K1,K2
CO2	Understand and apply different approaches and models for phylogenetic analysis and tree construction	K2,K3
CO3	Use appropriate knowledge and recognize problem-solving skill to develop new algorithms	K3,K4
CO4	Analyse biological data using a variety of bioinformatics tools accessible on the network	K3
CO5	Apply various visualization tools and techniques for visualizing biomolecular structures	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **15 Hrs.**

Introduction to internet-Usage of World Wide Web through Internet Explorer - internet server – URL - HTML – HTTP - Scope - Fields related to Bioinformatics - Application of Bioinformatics – Human. **genome.**

UNIT II **15 Hrs.**

Molecular biology - General account of Nucleic acid – structure and chemistry of DNA – RNA - Genes - gene Expression - Genetic code - Protein synthesis.

UNIT III **15 Hrs.**

Introduction to Data base - Biological data bases - Objectives of Biological Databases - Types – Sequence data bases - NCBI – EMBL - DDBJ - Swiss Prot. PIR-PRF - Structural data bases – PDB - Carbohydrate database - Literature databases - Pub Med - Agricola.

UNIT IV **15 Hrs.**

Sequence Analysis - Data mining - Sequence alignment - CLUSTAL W, Gene Finding - Protein secondary structure prediction and tools. Phylogenetic analysis - Construction of phylogenetic tree and its uses.

UNIT V **15 Hrs.**

Gene finding - Proteomics – Genomics - Metabolomics- Drug designing **–** Biomolecular Visualization tools.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Arthur, M. Lesk	Introduction to Bioinformatics	Oxford University Press, New York.	2003, 1st Edition
2.	Mani, L. and Vijayaraj,N	Bioinformatics for beginners	Kalai Kathir Achagam, Coimbatore.	2002, 1st Edition
3.	Sundar Rajan, S. and Balaji, R.	Introduction to Bioinformatics	Himalaya Publishing House, Mumbai.	2005, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Andreas, D., Baxevanis, and B.F., Francis	Ouelletle Bioinformatics	John Wiley Sons Inc., PVT., LTD., Singapore	2002, 1st Edition
2.	Rajadurai, M.	Bioinformatics	PBS Book Enterprises, Chennai	2010, 1st Edition
3	Attwood,T.K	Bioinformatics	Benjamin Cummings Publishing Company.	2007, 1st Edition
4.	Shanmugavel,P. & Wadhwa G.	Praticals in Bioinformatics	Pointer Publishers,Jaipur, India	2012, Revised Edition

Web Resources

https://www.techopedia.com/definition/1660/email-server-email

https://en.wikipedia.org/wiki/Gene_expression

https://www.khanacademy.org › ... › Central dogma and the genetic code

https://en.wikipedia.org/wiki/Biological_database

https://www.slideshare.net/pscad123/phylogenetic-analysis

https://www.expasy.org/resources/.../keywords:secondary%20structure%20prediction

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar, Gene finding

SEMESTER III

CODE	COURSE TITLE
18BOPS302	HORTICULTURE

Category	CIA	ESE	L	T	P	Credit
Skill Based Subject - II	25	75	40	5	-	5

Preamble

To understand the basic aspects of outdoor gardening.

To know the cultivation methods of vegetables and fruits.

To enhance the skill in plant propagation methods.

Syllabus

UNIT I **9 Hrs.**

Horticulture -History and importance of Horticulture - Soil types – Bio-fertilizers - Methods of plant propagation- layering- cutting – grafting.

UNIT II **9 Hrs.**

Outdoor Gardening- Garden styles- Lawn making- Kitchen garden- Rock garden - Water garden - Floriculture: cut flower

UNIT III **9 Hrs.**

Indoor gardening -Terrarium- Bottle and Dish garden Hanging basket –Hydroponics- Bonsai - flower arrangement- dry decoration-Ikebana

UNIT IV **9 Hrs.**

Cultivation of Vegetable- Bulb vegetable - Onion- Garlic; Tuber Vegetable – Potato; Root Vegetable – Carrot- Radish-Beetroot.

UNIT V **9 Hrs.**

Cultivation of fruits – Banana - Mango- Papaya, Grapes-Vegetable and fruit carving - preservation of fruits and vegetables.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	**Kumar, N**.	Introduction to Horticulture	Oxford IBH Publishing Co. Pvt.Ltd, New Delhi.	2010, Revised Edition
2.	**Prem Singh Arya**	A text book of vegetable culture,	Kalyani publishers,	2002, Revised Edition
3.	**Das** ,P.C.	Vegetable crops of India	Kalyani publishers	2003, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	**Aiyar, Yegna Narayana, A.K.**	Field crops of India	Bangalore Printing and Publishing Company, Bangalore	1980, 1st Edition
2.	**Sivaranjan, V.V.** and **Indira Balachandra**	Ayurvedic drugs and their plant sources	Oxford- IBH, Bangalore.	1994, 1st Edition

Web Resources

https://en.wikipedia.org/wiki/Horticulture

https://www.clearias.com/different-soil-types-india-understand-differences/

https://www.englishgardens.com/gardening/outdoor-gardening

https://en.wikipedia.org/wiki/Fruit_tree

https://www.maximumyield.com/definition/793/indoor-gardening

https://www.pinterest.com/GailColita/dish-gardens/

https://www.explainthatstuff.com/hydroponics.html

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar.

SEMESTER III

CODE	COURSE TITLE
18BOPS303	**GREEN MEDICINE**

Category	CIA	ESE	L	T	P	Credit
Skill Based Subject – III	25	75	40	5	-	5

Preamble

To acquire the knowledge about the herbal plants.
To update knowledge on plants used by tribal society.

Syllabus

UNIT – I **9 Hrs.**

Ethnobiology- Ethnic society of India-Wild plants and Medicinal Plants used by the Tribal society. Cultivation- Morphological and anatomical structure- chemicals and uses of Digestive drug- *Cuminum cyminum,* Antitumour drug – *Catharanthus roseus,* Anti diabetic drug – *Gymnema sylvestre.*

UNIT – II **9 Hrs.**

Carminative drugs- Cultivation- Morphological and anatomical structure- chemicals and uses – Ginger- Coriander- Asafoetida- Pepper- Clove – Garlic.

UNIT – III **9 Hrs.**

Antiseptics and cardiotonics - Cultivation, Morphological and anatomical structure - chemicals and uses- *Curcuma longa- Azadirachta indica – Digitalis - Terminalia arjuna.*

UNIT – IV **9 Hrs.**

Herbal Cosmetics- Preparations – lotions- Hand lotions, Sun Screen lotions - Lipsticks- Skin Fresheners- Face powders.

UNIT – V **9 Hrs.**

Traditional formulations and uses- Preparation of jams, jellies, syrups, pickles and squashes of *Carica papaya- Syzygium cumini- Punica granatum- Emblica officinalis- Ficus racemosa.*

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	**Gokhale,S.B., Kokate,C.K.** and **Purohit, A.P.**	Pharmacognosy	Nirali Prakashan, Pune.	2002,16th Edition
2.	**Panda, H.**	Herbal Cosmetics Handbook	Asia Pacific Business Press Inc., New Delhi	2008, Revised Edition
3.	**Sheelawant Patel**	Medicinal Trees – Distribution, Characteristics and Traditional Therapeutic Formulations	Pointer Publishers, Jaipur.	2009, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	**Rajiv. K. Sinha** and **Shweta Sinha.**	Ethnobotany.	Kalyani Publishers, New Delhi.	2001, Revised Edition
2.	**Sivaranjan, V.V.** and **Indira Balachandra**	Ayurvedic drugs and their plant sources	Oxford- IBH, Bangalore.	1994, 1st Edition

Web Resources

https://en.wikipedia.org/wiki/Ethnobiology

https://www.diabetes.co.uk/diabetes-medication/antidiabetic-drugs.html

https://en.wikipedia.org/wiki/Carminative

https://en.wikipedia.org/wiki/Carminative

https://en.wikipedia.org/wiki/Antiseptic

https://www.omicsonline.org/open-access/herbal-cosmetics-and-cosmeceuticals-an-overview-2329-6836-1000170.php?aid=42140

http://www.pickyourown.org/jam.htm

http://www.agriinfo.in/default.aspx?page=topic&superid=2&topicid=2073

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar

SEMESTER IV

CODE	COURSE TITLE
18BOPC410	GENETIC ENGINEERING AND BIOTECHNOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To understand the transgenic technology in plants.

To study the microbial production of organic acids and organic manure.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on the molecular tools of gene cloning technique	K1,K2
CO2	Understand and analyse the trangenic plants and to apply the technique in crop improvement	K2,K3
CO3	Apply the techniques in genetics and molecular biology	K3, K4
CO4	Develop entrepreneurial skill in mining and protect environment	K4
CO5	Apply nanoparticles in the biological systems to create and use material structures, devices for potential benefits	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **18 Hrs.**

Genetic Engineering- Scope of genetic engineering –Molecular Tools for genetic engineering- Enzymes-vectors -Methods of Gene cloning – Polymerase chain reaction-Gene Libraries - Application of Genetic engineering.

UNIT II **18 Hrs.**

Transgenic plants and Nitrogen fixation - Gene transfer methods -Marker genes and uses –applications of transgenic plants- resistance to biotic and abiotic stresses- improvement of crop yield – transgenic plants as bioreactors- mehanism of nitrogen fixation –Genetic manipulations for nitrogen fixation **-** Nif-Hup- Nod genes.

UNIT III **18 Hrs.**

Molecular markers and Gene therapy- Types of Molecular markers and its application**-** RFLP- RAPD-VNTRs-Diagnosis of genetic diseases-Gene therapy methods-methods of gene drug delivery-Vaccines-Genetic counseling- Biosafety.

UNIT IV **18 Hrs.**

Environmental Biotechnology: Biomining –bioleaching-removal of metals from water- microbial enhancement of oil recovery –Bioremediation – Phytoremediation –naturally occurring plants for phytoremediation-transgenic plants for phytoremediation- Biodegradation of Xenobiotics

UNIT V **18 Hrs.**

NanoBiotechnology – Nanoparticles as building block**s,** Drug delivery systems – Prostheses and Implants – Microarrays **–** Gene Chip –Nano technology in agriculture and food.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Gupta ,P.K.	Plant biotechnology	Rastogi publications, Meerat	2010 1st Edition
2.	Dubey, R.C	A text book of Biotechnology	S. Chand & Company	2006, 4th Revised Edition
3.	Subbiah Balaji	Nanobiotechnology	MPJ Publishers	2010, 1st Edition
4.	Satyanarayana.U	Biotechnology	Uppala Author-Publisher Interlinks	2008 Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Glazer, A.N. and Nikaids, H	Microbial Biotechnology	W.H. Freeman & Company, New York	1995, 1st edition
2.	Kumar, H.D.	Modern Concepts of Biotechnology	Vikas publishing house Pvt. Ltd	2014, Revised Edition

Web Resource

https://explorebiotech.com/7-important-molecular-tools-genetic-engineering/

https://www.sciencedaily.com/terms/transgenic_plants.html https://www.nibib.nih.gov/science-education/science-topics/drug-delivery-systems

https://www.sciencedirect.com/topics/earth-and-planetary-sciences/phytoremediation

https://www.nanowerk.com/nanotechnology/.../introduction_to_nanotechnology_1.ph.

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar

SEMESTER – IV

CODE	COURSE TITLE
18BOPC411	ECOLOGY AND CONSERVATION BIOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To know the exclusivity of the varying habitats in the biosphere

To acquire the knowledge about the structure and functions of different ecosystems

To create awareness on environmental protection and conserve biodiversity for future generation

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the various habitats and their vegetation	K2,K3
CO2	Know the concept of succession and concepts of biogeochemical cycles	K2,K3
CO3	Aware of different types of pollutions and recent problems concerning with global warming, ozone depletion and effect of green house	K2,K4
CO4	Know-how the methods of environmental audits and environmental impact	K4
CO5	Understand the conservation problems, analyze the causes behind the vulnerability and extinction risks of populations	K2,K3

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	M
CO2	S	M	S	S	M
CO3	S	S	S	M	M
CO4	M	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT- I **(15 Hrs.)**

Ecosystem - Structure and function - Basic Concept of Population ecology, speciation, characteristics of population, Inter and Intra- specific relations among populations, positive and negative interactions – Synecology – classification - structure methods of studying plant Communities- Phytogeographical regions of India.

UNIT-II **(15 Hrs.)**

Plant Succession- Causes of succession - Climax concept - Types of succession – Hydrosere – Xerosere – Lithosere. Biogeochemical cycles - Hydrological cycle - Nitrogen - oxygen – Sulphur – Carbon - Phosphorus.

UNIT- III **(15 Hrs.)**

Environmental problems and Management - Types – Soil – Water – Air - Radiation and Noise Pollution and Management - El-nino and La-nino - Green house effect - Global warming - Impact of Pollution on vegetation – Ecological indicators.

UNIT-IV **(15 Hrs.)**

Natural Resources - Types – Depletion – Conservation –Disaster management and Rehabilitation. Awareness Programmes on Environmental Days (World Environmental day, World Wetlands day, World Forestry day, World Water day, International day for Biological Diversity). Conservation: Afforestation – Chipko movement - Biosensors – application of remote sensing.

UNIT-V **(15 Hrs.)**

Biodiversity conservation - Genetic, species and ecosystem biodiversity- importance – Degeneration – Conservation strategies for plant genetic resources: *In-situ* conservation: National parks, Wildlife Sanctuaries, Biosphere reserves – *Ex-situ* conservation: Botanical and herbal gardens, zoological parks, seed orchards and gene banks. IUCN Classification – Red data Book. Social Forestry - Man – Wild life conflicts – Causes – Remedial measures.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ambhast, R.S	A text book of plant ecology	Students, Friends & Co, Varanasi	1988, 15th Edition
2.	Asthana D.K. and Meera Asthana	A Text book of Environmental studies.	S. Chand & Co. New Delhi	2006, 1st Edition
3.	Pandey, S.N. and Misra, S.P.	Environment and Ecology	Ane Book Pvt. Ltd., New Delhi.	2011, 3rd Edition
4.	Sharma, P.D.	Ecology and Environment	Rastogi Publications, Meerut	2005, 7th Edition (Reprint)

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhatia, A.L. and Kohli, K.S.	Environmental Biology	Ramesh book depot, Jaipur, New Delhi.	2005,Revised Edition
2.	Prabhu,P.C., Udayasoorian, C. and Balasubramanian, G.	An Introduction to Ecology and Environmental Science	Avinash Paperbacks, Delhi.	2009, 2nd Edition
3.	Babar,M.D.	Environmental changes- Natural Disasters	New India Publishing Agencies, New Delhi	2007, 1st Edition
4.	Trivedi, P.R. and Gurudeep Raj.	Environmental Wildlife and Plant Conservation	Akashdeep Publications. Hojuse, Newdelhi	1992, 1st Edition

Web Resource

https://www.britannica.com/science/autecology
https://notes.tyrocity.com/introduction-and-process-of-plant-succession/
https://sciencing.com › Science › Nature › Environment
https://kids.britannica.com/kids/article/natural-resource/399553
https://en.wikipedia.org/wiki/IUCN_Red_List

Pedagogy

Lecture - Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar, Vegetational Analysis

SEMESTER - IV

CODE	COURSE TITLE
18BOPC412	RESEARCH METHODOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To understand some basic concepts of research and its methodologies

To study the methods of writing research articles

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Evoke the information about various principles, methodology and uses of instruments.	K1,K2
CO2	Acquire the knowledge of basic to advance microscopes.	K2,K3
CO3	Attain the statistical knowledge and their role.	K3, K4
CO4	Develop skill to select and define appropriate research problem and parameters	K3, K4
CO5	Enhance the skill to write a research report, thesis and proposal	K3,K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	M
CO2	M	S	S	S	S
CO3	M	S	M	S	M
CO4	S	M	M	S	S
CO5	S	M	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT - I **(15 hrs.)**

Lab techniques - Principles, methodology and uses of Spectroscopy - Infrared, Visible and NMR. Electrophoresis - Agarose gel - Blotting techniques - Microscopy – SEM - TEM and Fluorescent - Chromatography - HPLC.

UNIT - II **(15 hrs.)**

Lab techniques - Extraction – isolation – characterization, identification and quantification of secondary metabolites - Alkaloid – Flavonoids - Terpenoids and Glycosides.

UNIT - III **(15 hrs.)**

Biostatistics - Collection of data – Primary data – Secondary data. Presentation of data - Tabulation - graph. Measures of central tendency - Mean (only arithmetic) - Median - Mode. Measures of dispersion – Range - Standard deviation- Standard error. Probability – Theorems of probability. Student's't' Test. Chi-square test - Analysis of variance (ANOVA - Theory only).

UNIT - IV **(15 hrs.)**

Research Methodology - Objectives of research - Types of Research- Significance of Research Process - Research Problems - Research Design – Sampling Design- Measurement and scaling techniques

UNIT - V **(15 hrs.)**

Interpretation and Report writing – Review of literature - Steps in writing report - layout of the report - Types of report - Mechanics of writing. Manuscript for publication and proof correction. Citation index, impact factor, h – index and plagiarism.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kothari, C.R.	Research Methodology - Methods and Techniques	New Age International Publishers	2011, 2nd Edition.
2.	Veerakumari, L.	Bio instrumentation	MJP Publishers, Chennai	2009, 1st Edition.
3.	Saravanavel, P.	Research Methodology	Kitav mahal, New Delhi.	2010, 3rd Edition.

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Misra,R.P.	Research Methodology- A Hand Book	Concept Publg Company , New Delhi.	2000, 1st Edition.
2.	Zar, J.K.	Biostatistical analysis	Prentice-Hall Internatioinal, INC, Engleword chiffs, New Jersey.	1984, 5th Edition.
3.	Vijay upagade and Arvind Shende	Research Methodology,	Chand & Co., New Delhi.	2010, 1st Edition.
4.	Kaur, H.Pragati	Instrumental methods of chemical analysis,	Prakashan, Meerut.	2001, 6th Edition.

Web Resource

https://serc.carleton.edu/research_education/geochemsheets/techniques/SEM.html

https://www.sciencedirect.com/topics/biochemistry-genetics-and.../secondary-metabolite

udel.edu/~mcdonald/HandbookBioStat.pdf

https://www.qualtrics.com/blog/research-problem/

https://researchguides.uic.edu/c.php?g=252299&p=1683205

Pedagogy

Lecture - Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar, collection of data.

SEMESTER IV

PRACTICAL - III

CODE	COURSE TITLE
18BOPCP03	**TAXONOMY AND BIOSYSTEMATICS, GENETIC ENGINEERING AND BIOTECHNOLOGY AND ECOLOGY AND CONSERVATION BIOLOGY**

Preamble

Category	CIA	ESE	L	T	P	Credit
Core Practical - III	40	60	-	-	90	4

To conserve the biodiversity.

To identify the locally available plants.

To understand the relationship of Taxonomy with other fields of Biological science.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge of economically useful plants	K1
CO2	Apply the knowledge for identifying the plant name	K4
CO3	Understand the various habitats and their vegetation	K2
CO4	Understand the conservation problems, analyse the soil quality	K1 , K3
CO5	Apply structural and functional genomics approaches on newly sequenced genome for functional characterization of genes.	K3, K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	S	M	S
CO3	S	S	S	M	M
CO4	S	M	S	M	M
CO5	S	S	S	S	**S**

S- Strong; M-Medium; L-Low

Syllabus

TAXONOMY AND BIOSYSTEMATICS

1. Study of the Taxonomical characters of the above mentioned families with economic importance
2. Preparation of artificial key
3. Submission of herbarium sheets – No. 40.
4. Field trip

GENETIC ENGINEERING AND BIOTECHNOLOGY

1. PCR techniques
2. DNA Isolation
3. Biological waste treatment
4. Nitrogen fixing genes
5. Plasmid
6. Transgenic plants
7. Bioleaching

ECOLOGY AND CONSERVATION BIOLOGY

1. Determination of Linear changes in vegetation by using line and belt transect methods.
2. Determination of frequency- density- abundance- dominance index. Similarity Index & Diversity Index by using quadrat frame.
3. Estimation of total biomass and herbage yield by harvest method.
4. Soil and water
   i) Garden soil experiment to know texture.
   ii) Capillary water
   iii) Chemistry of soil (NO_3, PO_4, SO_4)
   iv) pH of the soil

SEMESTER IV
PRACTICALS IV

CODE	COURSE TITLE
18BOPCP04	**PLANT PHYSIOLOGY AND PHYTOCHEMISTRY,BIOINFORMATICS AND RESEARCH METHODOLOGY**

Category	CIA	ESE	L	T	P	Credit
Core Practical - IV	40	60	-	-	120	4

Preamble

To understand the movement of water and solute.

To learn the metabolic and biochemical reactions in plants.

To acquire knowledge of the multiple data repositories and develop the ability to distinguish various types

To apply the open source tools for genome analysis and for solving the biological problems

To study the principles and working mechanism of various instruments

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify soil microorganisms and their role in agriculture	K1
CO2	Analyse the phytochemicals qualitatively	K2,K3
CO3	Understand the algorithm and apply it in gene finding	K2, K4
CO4	Understand the importance of bioinformatics tools and apply it in life science research	K4
CO5	Analyse the principles and apply the working methodology of various instruments	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	**M**
CO2	S	M	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	**S**

S- Strong; M-Medium; L-Low

Syllabus

Practicals

PLANT PHYSIOLOGY AND PHYTOCHEMISTRY

a. Plant Physiology

Individual Experiments

1. Determination of Osmotic Pressure (OP) of cell sap of given specimen (Rheo leaf)
2. Determination of Diffusion Pressure Deficit (DPD) with potato tuber.
3. Comparison of the rate of respiration in germinating seeds and flower buds using simple Respirometer.
4. Rate of photosynthesis under varying CO_2 concentrations in a water plant.
5. Effect of intensity of light on O_2 evolution during photosynthesis using Wilmott's bubble counter.
6. Determination of water absorption/transpiration ratio.
7. Calculation of stomatal index in upper and lower epidermal peelings and the percentage of leaf area
8. Measurement of Respiratory Quotient in germinating seeds.

Demonstration Experiments

1. Nitrification by soil microorganisms.
2. Effect of GA_3 on amylase activity in cereals.
3. Effect of IAA on excised shoot/hypocotyl cuttings of legumes.
4. Demonstration of transpiration rate using simple Potometer

b. Bio-Chemistry

Individual Experiments

1. **pH** : Measure the pH of cell sap and soil solution.

2**. Buffer**: Preparation of phosphate and citrate buffer.

3. **Chromatography**

I. Paper Chromatographic technique

Separation of leaf pigments

Separation of amino acids.

II. Thin layer chromatographic technique

Separation of leaf pigments

III. Column chromatographic technique to separate chloroplast / Flower pigments.

4. Qualitative and quantitative methods

i) Extraction of plant material-cold percolation

ii) Qualitative analysis of phytochemicals

iii) Total free amino acids (Ninhydrin reagent method)

iv) Proteins (Lowry *et al*. 1951 method.)

v) Total soluble carbohydrates (Anthrone method)

vi) Starch (Clegg's 1956)

Demonstration Experiments

1) Agarose gel Electrophoresis

2) Determination of absorption spectra of chlorophyll a and b with spectrophotometer

3) Extraction of plant materials using Soxhlet Apparatus

BIOINFORMATICS

1. Literature Database – Pub Med
2. DNA Data Bank
3. Gene prediction using Genemark-Algorithm
4. Proteins- Secondary structure prediction- Algorithm
5. Sequence Alignment

RESEARCH METHODOLOGY

1. Principles and working mechanism of Spectrophotometer, Blotting Techniques, SEM, TEM and HPLC

2. Problems in Mean, Median, Mode, Standard Deviation, Standard Error, Student 't' test and Chi-square test.

VELLALAR COLLEGE FOR WOMEN (AUTONOMOUS), ERODE-12.

M.Sc. DEGREE PRACTICAL EXAMINATIONS, 2019

Core Practical - III

TAXONOMY, BIOSYSTEMATICS, GENETIC ENGINEERING, BIOTECHNOLOGY, ECOLOGY & CONSERVATION BIOLOGY

Hrs: 4 **Sub. Code: 18BOPCP03**

Max. Marks: CIA 40;ESE - 60 **Credits:4**

I.	Determine the binomials of **A** & **B** with the aid of Gamble's flora.	**2 x 5 = 10**
II.	Refer the specimens **C** & **D** to their respective families giving the Salient features indicating their hierarchy.	**2 x 4 = 8**
III.	Using the vegetative and floral characters construct an artificial Key for the specimens **E, F, G, H, I** & **J**. Tabulate the result in a Comparison chart.	**6**
IV.	Give the family and Binomial of **K** & **L**	**4**
V.	Analyze the vegetation **M.** Find out the index of dominance.	**7**
VI.	Write notes of interest on **N, O, P, Q & R.**	**5 x 3 = 15**
		50
	Herbarium	**5**
	Record	**5**
	Total	**60**

-

PRACTICAL - III

SCHEME OF VALUATION

Time : 4 hrs. **Maximum : 60 marks**

I.	**A** & **B**	Genus - 2 Species - 1 Family - 1 Authority - 1	**2x5 =10**
II.	**C** & **D**	Family - 1 Salient features - 3	**2x4= 8**
III.	**E, F, G, H, I** & **J**	Key - 3 Comparison chart - 3	**6**
IV.	**K** & **L** - Herbarium specimen	Family - 1 Binomial - 1	**2x 2 = 4**
V.	**M** - Quadrat	Data - 5 Comment - 2	**7**
VI.	**N** - Economic Botany **O** - Economic Botany **P** - Biosystematics **Q** - Genetic Engineering **R** - Ecology		**5 x3 = 15**
			50
		Herbarium	**5**
		Record	**5**
		Total	**60**

VELLALAR COLLEGE FOR WOMEN (AUTONOMOUS), ERODE-12.

M.Sc. DEGREE PRACTICAL EXAMINATIONS - 2019

Core Practical - IV

PLANT PHYSIOLOGY& PHYTOCHEMISTRY, BIOINFORMATICS AND RESEARCH METHODOLOGY

Hrs: 4 **Sub.Code:18BOPCP04**

Max. Marks: CIA 40; ESE -60 **Credits: 4**

I . Write the procedure and requirements for the experiments **A** & **B** assigned to you by lot. Perform the experiments, Collect the necessary data and present your conclusion. Leave the setup for valuation. **2 x 10 = 20**

II. Comment on the setup **C** & **D** **2 x 4 = 8**

III. Write down the algorithm for the given practical of **E** **7**

IV. Workout the given Problem **F** **7**

V. Write notes of interest on **G** and **H** **2 x 4 = 8**

50

Record **10**

Total **60**

PRACTICAL - IV

SCHEME OF VALUATION

Time: 4 hrs. **Max. Marks: 60**

I.	**A**	- Plant physiology		
	B	- Phytochemistry	Set up - 3	
			Procedure - 3	
			Data & Result - 4	
				2 x 10 = 20
II.	**C**	- Plant physiology		
	D	- Phytochemistry		**2 x 4 = 8**
III.	**E**	- Algorithm in Bioinformatics (Gene finding/Protein prediction)		**7**
IV.	**F**	- Biostatistics		**7**
V.	**G**	- Bioinformatics		
	H	- Research Methodology		**2 x 4 = 8**
				50
				Record **10**
				Total **60**

SELF LEARNING PAPER - I
WEALTH FROM WASTES

Max. Marks: ESE - 100 **Sub.Code: 13BOPSL02**

Credit: 5

Objectives:

Gaining momentum in the millennium by utilizing the available wastes and channel them towards economic activities.

UNIT I

Organic wastes – Compost making – Different methods, sources of Biogas generation (Animal, Human, Agriculture, Aquatic & Industrial wastes).

UNIT II

Biomedical wastes – Sources, types, Disposal methods, segregation, Recycling – composting, Incineration.

UNIT III

Coir wastes in Agriculture – Coir waste compost – Composition, Coirwaste briquetting, application of briquetting. Coirwaste in Poultry and Crop Production, Coir waste as mulch and rooting medium.

UNIT IV

Agricultural wastes – Paper manufacturing – Kinds of agricultural wastes, operations in paper and paper board making. Sugarcane wastes – Pressmud – Bioearth, Sugarcane trash composting, creating art objects, Mushroom cultivation.

UNIT V

Sewage water – Utilization sewage water, sewage treatment, Treatment of Effluent – Paper mill, Distillery, Vermi Composting.

References:

1. **Asthana, D.K. and Meera Asthana,** *"Environment Problems and Solutions",* S.Chand and Company Ltd. First Edition, 2002.

2. **Dubey, R.C.,** *"A text book of Biotechnology",* S. Chand and Company,2001.

3. **Kumaresan, V.**,*"Biotechnology",* Saras Publication, Chennai, 2005.

4. **Narayana Rao, M.** and **Amal K. Dutta,** *"Waste water treatment"*, Oxford IBH Publishing Co. Pvt. Ltd. New Delhi, second edition, 2003.

5. **Palaniappan, S.P. and K. Annadurai,** *"Organic farming theory and practice",* Scientific Publiucations, Jodhpur, India. 2003.

6. **Sakharkar, B.M.,** *"Principles of Hospital Administration and Planning",* First Edition, Published by Jaype Brothers, 2003.

7. **Sathe, T.V.**,*"Vermiculture and Organic farming"*, Daya Publishing house, New Delhi, 2004.

Components of CIA Marks (Theory)

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
10	5	10	25

Components of CIA Marks (Practicals)

Tests (I & II)	Record	Performance	Model Examination	Total
10	5	15	10	40

CIA

Bloom's Category	Section	Choice	Marks	Total
K2	A	Compulsory	2 x 2 = 4	30
K3, K4	B	Either / Or	2 x 5 = 10	
K4, K5	C	Either / Or	2 x 8 = 16	

Model and End Semester Examination

Bloom's Category	Section	Choice	Marks	Total
K2	A	Compulsory	5 x 2 = 10	75
K3, K4	B	Either / Or	5 x 5 = 25	
K4, K5	C	Either / Or	5 x 8 = 40	

Components of CIA Marks			
Tests (I & II)	**Assignment / Seminar / Subject Viva**	**Model Examination**	**Total**
10	5	10	25

SKILL BASED SUBJECT

Choice	Marks	Total
Open Choice (5 out of 8)	5 x 15	75

SELF LEARNING PAPERS

Choice	Marks	Total
Open Choice (5 out of 8)	5 x 20	100