

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 Bacillariophyceae Phylogeny 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 – Sphaerocarpaceae- 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	2009-1 st Edition
3.	Foster, A. S.and Gifford, E. M.	Comparative Morphology of Vascular Plants	W.H. Freeman and Co	1973-1 st 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 enzymes- 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, 2 nd Edition
3.	Mishra, A./ Bohra, A. and Mishra, A.	Plant Pathology	Agrobios India	2011, 1 st 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, 2 nd Edition
2.	John Webster and Roland W.S. Weber	Introduction to Fungi	Cambridge University Press	2007, 3 rd 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 to Angiospermic 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 <i>in situ</i> and <i>ex situ</i> 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, Nilssonaceae) – 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, 2 nd 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, 2 nd Edition
2.	Verma,H.K.	Pteridophyta	Random Publisher	2011, 1 st 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,development - 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, 1 st Edition
2.	C.R.Metcalf&L.Chalk	Anatomy of the dicotyledonsvol-II	Clarendon press Oxford	1985, 1 st Edition
3.	Sharma,H.P.	Plant Embryology	Narosa Publishing House	1977, 1 st Edition

Reference Books

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

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 and nucleolus- Chromosomes – ultra structure and function, specialized 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	2005,1 st Edition
2.	Razdon, M.K.	Introduction to plant tissue culture	Oxford IBH Publishing co. PVT., LTD New Delhi	2003, 2 nd Edition
3.	Dubey,R.C.	Text book of Biotechnology	S.Chand& Company Ltd. Ram Nagar,New Delhi	2009, 6 th 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, 2 nd Edition
2.	Gupta,M.L.,Jangir,M.L.	Cell Biology	Agrobios India	2012, 1 st 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, 5 th 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). Physical and 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, 4 th 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, 1 th Revised

Reference Books

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