SEMESTER – I

Core Paper – II

PHYCOLOGY, BRYOLOGY AND LICHENOLOGY

Instructional Hrs.: 75 **Sub. Code:16BOPC102**

Max. Marks: CIA 25; ESE -75 **Credits:4**

Objectives: To understand the Range of thallus – Structure - Reproduction methods and life cycle pattern of lower plants and to understand the role of Lichens in human welfare.

UNIT - I **15 Hrs.**

ALGAE : Classification of Algae (Fritsch, 1945)- Phylogeny and interrelationship - Range of thallus – ***Pigmentation*** **-** Reproduction and life cycle patterns of Chlorophyaceae and Bacillariophyceae

UNIT - II **15 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 **15 Hrs.**

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

UNIT - IV **15 Hrs.**

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

UNIT - V **15 Hrs.**

LICHENS : 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.***

Note: **Bold** *and* ***Italics*** **denote self study topics.**

Practicals :

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

REFERENCES:

1. **Bold, H.C.,** and **Wyne, H.J.,** *"Introduction to the Algal structure and reproduction",* Prentice Hall, Engle wood Cliffs, New Jersey, 1978.
2. **Chapman, V.J.** and **Chapman, P.J.,** *"The algae",* The English language book society and Macmillen Publications, 1973.
3. **Fritsch, F.E.,** *"Structure and reproduction of the Algae"*. Vol. I, II & III, 1935-1945.
4. **Lee, R.E.,** *"Phycology",* Cambridge University Publications, London,1987.
5. **Parihar, N.S.,** *"An introduction to bryophytes"* Vol. III. Central book Depot. Allhabad, 1967.
6. **Vashishta, B.R., Sinha, A.K. and Adarshkumar**, *"Botany for degree students – Bryophyta", S. Chand* & *Company Ltd., New Delhi, Revised Edition, 2008.* 8.
7. **Frank Cavers** .The Inter Relationships of the Bryophyta, S.R.Technico Book house.1981
8. **Watson E.V.,** The Structure and life of Bryophytes. Hutchinson University Library, London, 1971.
9. **Prempuri,** Bryophytes; Morphology Growth and Differentiation. Atma Ram and Sons, 1986.

10. **Foster, A. S.** and **Gifford, E. M.** Comparative Morphology ofVascular Plants W.H. Freeman and Co.1973.

SEMESTER – I

Core Paper – IV

PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

Instructional Hrs: 75 **Sub. Code: 16BOPC104**

Max. Marks: CIA 25; ESE -75 **Credits: 4**

Objectives: To know gametophytic and sporophytic structural variations in Pteridophytes and Gymnosperms

UNIT - I **15 Hrs.**

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

UNIT - II **15 Hrs.**

Morphology - anatomy and reproduction of – Ophioglossales – Osmundales - Filicales – ***Salviniales*** - Sorus evolution.

UNIT - III **15 Hrs.**

Classification of Gymnosperms (Sporne, 1965), General account of Bennettitales – Pentoxylales- ***Cycadales* –** Ginkgoales.

UNIT - IV **15 Hrs.**

General account of Coniferales (Cupressaceae – Podocarpaceae – Araucariaceae - Pinaceae) Taxales - Gnetales - ***Angiospermic characters***.

UNIT - V **15 Hrs.**

Fossils: ***Types of fossils***- process of fossilization and importance of fossils - Detailed study of the fossil forms – Pteridohytes- Rhynia- Lepidodendron – Calamites – Sphenophyllum – Gymnosperms - Lyginopteris - Cordaites.

Note: Bold and ***Italics*** **denote self study topics.**

Practicals :

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.

REFERENCES:

1. **Rashid.A. 2007**. An Introduction to Pteridophyta - Vikas publications, New Delhi.
2. **Sporne, K.R. (1975).** The Morphology of Pteridophytes, Hutchinsonand Co., London.
3. **Foster, A. S.** and **Gifford, E. M.** Comparative Morphology of Vascular Plants. W.H. Freeman and Co.1973.
4. **Johri, RM, Lata S, Tyagi K** (2005), A text book of Gymnosperms, DominatePub and Distributor, New Delhi.
5. **John M. Coulter** and **Chamberlin C.J.,** *" Morphology of Gymnosperms",* Central book Depot., Allahabad, 1917.
6. **Vasishta, P.C., Sinha,A.K. and Anilkumar**, Botany for Degree Students Gymnosperms.S.Chand & co, New Delhi. 2006.
7. **Chester A. Arnold,** *" An introduction to Palaeobotany",* Agrobios (India), Jodhpur, 1947.

SEMESTER – II

Core Paper -VII

GENETICS, GERMPLASM CONSERVATION AND PLANT BREEDING

Instructional Hrs.: 90 **Sub. Code: 16BOPC207**

Max.Marks: CIA 25; ESE -75 **Credits:4**

Objectives: 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.

UNIT-I **18Hrs.**

Interaction of genes – Lethal factors- Modifying factors- collaborative factors. Co dominance - Quantitative inheritance - sex determination in plants- Theories of sex determination (theory of Heterogametic&Genic balance)-Sex limited characters- ***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 **18 Hrs.**

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 **18 Hrs.**

Germplasm conservation- World diminishing plant resources-***Threatened*** *and* ***endangered plants***- Red Data Books- The role of IBPGR (Rome, Italy) and NBPGR (New Delhi) in Germplasm Conservation - Patent and Intellectual Property Rights (IPR).

UNIT- V **18 Hrs.**

Plant breeding – Objectives, breeding methods in self-fertilized - cross fertilized and vegetatively propagated plants-Breeding plants for improving yield and quality and resistant to diseases- ***Distant hybridization in Plant breeding*.**

Note: Bold and ***Italics*** **denote self study topics.**

Practicals:

Solving Problems involving:

1. Interactions of factors

2. Sex linked inheritance

3. Quantitative inheritance

4. Calculation of gene frequencies

5. Training in hybridization techniques

REFERENCES:

1. **Arnold, R.W.**, *"Principles of Plant Breeding",* John Willey & Sons, 1960.

2. **Gilber, N.W.**, *"Organellar Heredity",* Revan Press, New York, 1978.

3. **Gupta, P.K.,** *"Genetics",* Rastogi Publication, Meerut, India, 1994.

4. **King, R.C.** , *" A Hand book of Genetics",* Plenium Press, New York, 1994.

5. **Singh, B.D.,** *"Plant Breeding: Principles and Methods*", Kalyani Publishers, 2008.

6. **Singh, B.D.,** *"Genetics*", Kalyani Publishers, 2008.

7. **Swaminathan, M.S.** and **Jana. S.**, *"Biodiversity",* Mac Millan, India Press, Madras, 1992.

8. **Verma P. S. and Agarwal , V.K.,** Genetics, S. Chand & Co, New Delhi, 2006.

SEMESTER – III

Core Paper - VIII

TAXONOMY AND BIOSYSTEMATICS

Instructional Hrs.:75 **Sub. Code:15BOPC308**

Max.Marks: CIA 25;ESE -75 **Credits:4**

Objectives: To conserve the biodiversity. To identify the locally available plants. To understand the relationship of Taxonomy with other fields of Biological science.

UNIT I **15 Hrs.**

Systems of classification- Artificial – Linnaeus - Natural – Bentham and Hooker Phylogenetic – Engler and Prantl - Modern – Cronquist – Merits and demerits. International Code of Botanical Nomenclature – Typification - Principles of priority and their limitations. Effective and valid publications - *citation*- retention - choice and rejection of names.

UNIT II **15 Hrs.**

Flora: Monograph - Keys - *Botanic gardens* -Modern trends in Taxonomy-Anatomy-Embryology-Palynology- Cytology- Chemotaxonomy

UNIT III **15 Hrs.**

Families-Systematic Position - Description and Economic uses of the following families Menispermaceae – Polygalaceae – Caryophyllaceae – Portulacaceae - Oxalidaceae – Meliaceae –Vitaceae – Rhamnaceae – Sapindaceae - Fabaceae – *Caesalpiniaceae* – Mimosaceae - Rosaceae – Onagraceae – Lythraceae - Aizoaceae.

UNIT IV **15 Hrs.**

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

UNIT V **15 Hrs.**

Biosystematics- Its aim and scope. Phenotypic plasticity. Turreson's work. Ecological differentiation- *Gene ecology*- Numerical taxonomy.

Note: *Italics* denote Self Study Topics.

Practicals

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. 50.
4. Field trip for 7 Days
5. Visit to BSI / Nilgiri Biosphere National Park

Reference Books

1. **Bennet, S.S.R.,** "*An Introduction to Plant Nomentature"* International Book Distribution, India, 1989.
2. **Davis** & **Hey wood**, *'Principles of angiosperm taxonomy"* Today and Tomorrow's Printers And Publishers, New Delhi, Revised Edition, 1965.
3. **Heslop J. Herrison,** "*New concepts in flowering plants taxonomy",* Heinemann Educational Books, India, Revised Edition,1970
4. **Lawrence H.M.,** *"Taxonomy of Vascular plants",* Mac Millan & Co, New Delhi,1979.
5. **Rendle A.R.,** *"A Classification of flowering plants",* Vol. I and II., Cambridge University Press,1979.
6. **Sokal S.R.** and **Sneath P.H.,** *" Principles of Numerical Taxonomy",* N.H. Freemen & Co.1977.
7. **Solbig,** *"Principles and methods of plant Biosystematics",* The Mac Millan Company, New Delhi,1985.
8. **Stace Clive A.,**"*Plant Taxonomy and Biosystematics",* Edward Arnold, London, Second Edition,1989.
9. **Attwood, T.K.** and **Parry Smith, D.J.,** *"Introduction to Bioinformatics",* Pearson Education Ltd., Fifth edition, New Delhi, 2003.

SEMESTER – IV

Core Paper - XI

GENETIC ENGINEERING AND BIOTECHNOLOGY

Instructional Hrs.:90 **Sub. Code:15BOPC411**

Max.Marks:100 **CIA25;ESE-75**
Credits:4

Objectives: To understand the transgenic technology in plants.
To study the microbial production of organic acids and organic manure.

UNIT I **18 Hrs.**

Genetic Engineering- Concepts of genetic engineering – Scope, Molecular Tools for genetic engineering- Cloning vectors (Out line)-Methods of Gene cloning –Polymerase Chain Reaction - Gene Libraries - Application of Genetic engineering.

UNIT II **18 Hrs.**

Gene transfer methods- Nif- Hup- Nod genes- Transgenic plants–Transgenic plants as Bioreactor- DNA sequencing methods

UNIT III **18 Hrs.**

Molecular markers and its application- DNA finger printing- Genetic counselling-. Gene therapy, Bone marrow transplantation, methods of gene drug delivery, Recombinant DNA Vaccine, Biochips

UNIT IV **18 Hrs.**

Biotechnology and Environmental Protection: Biomining – Bioleaching- removal of metals from water- microbial enhancement of oil recovery. Biomass & Bioenergy-source, Bio Gas, BioHydrogen , Petrochemical Plants

UNIT V **18 Hrs.**

Bioremediation & Bio degradation –Types of Bioremediation- Bio degradation of Xenobiotics – Genetically engineered organisms in biodegradation- Bioremediation in soil- Phytoremediation- Global environmental problems and sustainability through Biotechnology- Benefits and ethics of Biotechnology- Patenting Biotechnology inventions.

Note: *Italics* denote Self Study Topics.

Practicals

1. PCR techniques
2. DNA Isolation
3. Biological waste treatment

Spotters

1. Nitrogen fixing genes

2 Plasmid

3.Transgenic plants

4 Bioleaching

Reference Books

1. **Callow, A.J., Ford Lloyd, B.V.** and **New bury, H.J.,** *"Biotechnology and Plant Genetic Resources Conversation and Use",* CAB international, Oxon, UK.,1997.
2. **Dubey, R.C.,** *"A Text book of Biotechnology",* S. Chand & Company, 1999.
3. **Glazer, A.N.** and **Nikaids, H.,** *"Microbial Biotechnology",* W.H. Freeman & Company, New York, USA, 1995.
4. **Gupta, P.K.,** *"Elements of Biotechnology",* Rastogi Publication, 1998.
5. **Ignacimuthu, S.**, *"Basic Biotechnology",* Tata Mc Graw Hill Publishing Company Ltd. , Madras, 1985.
6. **Kartha, K.K.**, *"Cryopreservation of plant cells and organs",* CRC Press, Boca Raton, Flora, USA., 1985.
7. **Santharam, S.,** and **Montogomery, J.F.,** *"Biotechnology- Biosafety and Biodiversity',* Oxford and IBH Publishing Co., New Delhi,1999.
8. **Kumar, H.D.**,"*Modern Concepts of Biotechnology*", Vikas publishing house Pvt. Ltd., 2001.

SEMESTER – IV

Core Paper - XIII

RESEARCH METHODOLOGY

Instructional Hrs.:75 **Sub. Code: 15BOPC413**

Max.Marks: CIA 25; ESE -75
Credits:4

Objectives: To know the methods and usage of instruments. To study the methods of writing research articles.

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 - GLC and HPTLC.

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 and 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 - Characteristics of research - Objectives of research - Classification of research - Research Process - Research Problems –and -Criteria for selecting research problem - Steps in selecting research problem – Review of literature – Components and purpose , Journal article – web Browsing.

UNIT V **15 Hrs.**

Interpretation and Report writing – 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.

Note: *Italics* denote Self Study Topics.

Practicals

Spotters

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

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

Reference Books

1. **Kothari, C.R.,** *"Research Methodology – Methods and Techniques",* New Age International Publishers, 2011.
2. **Zar, J.K.**, *"Biostatistical analysis",* Prentice-Hall Internatioinal, INC, Engleword chiffs, New Jersey, 1984.
3. **Vijay upagade and Arvind Shende**., *Research Methodology*, S. Chand & Co., New Delhi, 2010.
4. **Veerakumari, L**, *Bio instrumentation*, MJP Publishers, Chennai, 2009.
5. **Kaur, H**., *Instrumental methods of chemical analysis*, Pragati Prakashan, Meerut, 2001.
6. **Saravanavel, P**., *Research Methodology*, Kitav mahal, New Delhi, 2010.
7. **Misra,R.P.,** *Research Methodology*- A Hand Book , Concept Publg Company , New Delhi, 2000.
8. **Rama Krishnan, P, "***Biostatistics"* Saras Publications, Nagercoil, First Edition, 2001.