

Department of Botany

M.sc. Syllabus for Semester System Examination w. e. f. July, 2014

1. The entire course of M. Sc. (Botany) will be of four semesters spread over within two years. Two semesters (I and II) will be covered in M. Sc. I and the two in M.Sc. II year.
2. In M. Sc. I (I and II sem.), there shall be five theory papers (each of 60 marks), one seminar (of 25 marks), one lab work (75 marks) based on theory papers (MOB- 101, 102, 103 and MOB-201, 202, 203) and one lab work (50 marks) based on theory paper (MOB-104, 105 and MOB- 204, 205).
3. In M. Sc II (III sem.), there shall be four theory papers (each of 75 marks), one seminar (25 marks), one lab work (100 marks) based on theory papers (MOB-301 and 302), one lab work (50 marks) based on theory papers (MOB-303 and 304) and a dissertation allotted during sem.III and evaluated during sem. IV.
4. In M. Sc. II (IV sem.) there shall be three compulsory papers (MOB- 401, 402 and 403; each of 75 marks) and one elective special paper (404A and 404B; 75 marks), one lab work (75 marks) based on theory paper MOB- 401, 402 and 403, one lab work (25marks) based on theory papers MOB- 404A or 404 B, and dissertation (50 marks; allotted during sem. III).
5. Each theory paper shall be having four units. There shall be two questions from each unit and the student will have to answer any one question out of the two .There shall be one compulsory question (short answer type) covering all four units.
6. For M. Sc. I students there shall be one obligatory long tour (in a year) out of the state to Botanical regions, Research institutes \ Centers.

M.Sc. I :***Semester-I***

Course Code	Title	Marks
MOB101	Phycology	60
MOB102	Mycology	60
MOB103	Bryophytes, Pteridophytes and Gymnosperms	60
MOB104	Angiosperms-Morphology and Taxonomy	60
MOB105	Plant Resource Utilization	60
MOB106	Seminar and Discussion	25
MOB107	Lab work based on 101,102 and 103	75
MOB108	Lab work based on 104 and 105	50

Semester-II

Course Code	Title	Marks
MOB201	Plant Developmental Biology and Morphogenesis	60
MOB202	Plant Ecology	60
MOB203	Phyto-geography and Soil science	60
MOB204	Tools, Techniques and Biostatistics	60
MOB205	Microbiology	60
MOB206	Seminar and Discussion	25
MOB207	Lab work based on 201,202,203	75
MOB208	Lab work based on 204 and 205	50

M.Sc. II :***Semester-III***

Course Code	Title	Marks
MOB301	Plant Physiology	75
MOB302	Plant Biochemistry	75
MOB303	Plant Molecular Biology	75
MOB304	Proteomics, Genomics and Bioinformatics	75
MOB305	Seminar and Discussion	25
MOB306	Dissertation (Allotment)	-
MOB307	Lab work based on 301 and 302	50
MOB308	Lab work based on 303 and 304	50

Semester-IV

Course Code	Title	Marks
MOB401	Stress Physiology	75
MOB402	Plant Biotechnology	75
MOB403	Cytogenetics and Plant Breeding	75
MOB404(A)	Environmental Biology	75
MOB404(B)	Plant Pathology	75
MOB405	Seminar, Discussion	25
MOB406	Dissertation (Evaluation)	50
MOB407	Lab work based on 401, 402and 403	75
MOB408	Lab work based on 404(A) or 404(B)	25

MOB-101: Phycology

Unit: I

Algae in diverse habitats

Thallus structure and organization

Criteria used in classification

Fritsch's system of classification, modern approaches to classification

Unit: II

Reproductive diversity, life history patterns and alternation of generations in Chlorophyta, Phaeophyta and Rhodophyta

General idea about evolutionary tendencies

Unit: III

Cyanophyta: Ultrastructure of Cyanobacterial cell, heterocyst differentiation and akinete development

Salient features of Prochlorophyta, Cryptophyta, Euglenophyta, Pyrrophyta, Chrysophyta, Bacillariophyta and Xanthophyta

Unit: IV

Phycoviruses

Algal blooms

Algae as food, biofuel and biofertilizers

Algae as source of bioactive molecules

Suggested Readings:

Algae: C. Van Den Hock

Algae: Ian Morris

Phycology: R. Lee

Algae and water pollution: C.M. Palmer

Phycology: H. D. Kumar

The biology of the algae: R. D. Round

Algae: F. E. Fritsch

Cyanophyta: T. V. Desikachary

Algae: Champman

Phycology: G. M. Smith

MOB-102: Mycology

UNIT: I

Introduction to fungi, thallus organization and mycelial modifications

Classification of fungi up to the rank of classes as given by Ainsworth (1973), Alexopoulos and Mims (1979) and Hawksworth et al. (1983)

UNIT: II

Reproduction and fungal nutrition (modes and mechanism)

General account of Sub-divisions: Mastigomycotina (Oomycetes) and Zygomycotina (Zygomycetes)

UNIT: III

General account of Sub-divisions Ascomycotina and Basidiomycotina.

Distinguishing characters of genera- *Stemonitis*, *Monoblepharis*, *Saprolegnia*, *Phytophthora*, *Peronospora*, *Albugo*, *Pilobolus*, *Entomophthora*, *Protomyces*, *Taphrina*, *Erysiphe*, *Phyllactinia*, *Xylaria*, *Claviceps*, *Morchella*, *Lycoperdon*, *Geastrum*, *Phallus*, *Cyathus*, *Ganoderma*, *Uromyces*, *Melampsora*, *Colletotrichum*, *Alternaria*, *Cercospora* and *Penicillium*

UNIT: IV

Mycorrhizae (Structure and role in agroforestry)

Mycotoxins

Biodeterioration of materials

Role of fungi in the maintenance of environment

Suggested Readings:

Introductory Mycology: C. J. Alexopoulos, C.W. Mims and M. Blackwell(1996)

An Introduction to mycology: R. S. Mehrotra and K.R. Aneja (1990)

An Introduction to Fungi: H. C. Dube (2005)

The Fungi: P.D. Sharma (2003)

MOB-103: Bryophytes, Pteridophytes and Gymnosperms

Unit: I

Classification of Bryophytes

Origin and evolution of gametophytes of Bryophytes

Evolution of sporophytes of Bryophytes

Economic importance of Bryophytes

Unit: II

Classification of Pteridophytes

Telome concept, its merits and demerits

The stele, types and their evolution in Pteridophytes

Unit: III

Classification of Gymnosperms and their distribution in India

A general account of: *Lyginopteris*, *Williamsonia* and *Pentoxylon*

Origin and evolution of Gymnosperms

Economic importance of Gymnosperms

Unit: IV

Introduction and methods of fossil studies

Applied palaeobotany with emphasis on carbon dating, coal, petroleum and pollen grains

Suggested Readings:

Cryptogamic Botany vol. II Bryophytes and Pteridophytes: Smith, G.M. (1955): 2nd ed. Mc Graw Hill. Book company inc. New York, Toronto, London

Bryophytes: A Broad Prospective: Puri Prem (1985); 2nd ed. Atma Ram & Sons Delhi, Lucknow.

Morphology and Evolution of Vascular Plants: Gifford, E. M and Foster, A. S. (1989) 3rd. W.H. Freeman and com. New York.

Morphology of Vascular Plants: Bierhorst, D. W. (1971); The Mac Millon com; New York.

Gymnosperms: Bhatnagar, S. P and Moitra, A. (1996); New Age International (P) Ltd, Publishers, New Delhi.

Syllabus for Semester System in M. Sc.

The Morphology of Gymnosperms: Sporne, K. R. (1974); Hutchinson Univ. Lib, London

Palaeobotany and the Evolution of Plants: Stewart, W. N. and Rothwell, G. W. (1993) 2nd ed.
Cambridge Univ. Press. U.S.A

The Evolution of Plants: Wills, K. J. and Mc Elwain, J. C. (2002); Oxford Univ. Press, New York.

The Biology and Evolution of Fossil plants: Taylor, T. N. and Taylor, E.L. (1993); 1ST ed.
Englewood cliffs: Prentice-Hall.

MOB-104: Angiosperms: Morphology & Taxonomy

Unit: I

System of classification by Bentham and Hooker; Engler and Prantl and Takhtajan.

Chemotaxonomy, Numerical taxonomy

Unit:II

Phylogeny of Angiosperms: Antiquity of origin, probable ancestors and cradle of angiosperms.

Morphology and evolution of flowers with special reference to carpel

Unit: III

Herbaria and Botanical gardens. Organization and activities of BSI. Plant nomenclature (ICN-2011)

Distinguishing features of the following families with special reference to local flora-

Monocot: Orchidaceae, Musaceae, Araceae, Commelinaceae, Lemnaceae, Alismaceae, Cyperaceae and Graminae

Unit: IV

Distinguishing features of the following families with special reference to local flora:

Dicot: Ranunculaceae, Magnoliaceae, Nymphaeaceae, Annonaceae, Caryophyllaceae, Capparidaecae, Teliaceae, Sterculiaceae, Linaceae, Meliaceae, Vitaceae, Sapindaceae, Anacardiaceae, Fabaceae, Caesalpinaceae, Mimosaceae, Lythraceae, Onagraceae, Rubiaceae, Asteraceae, Primulaceae, Saptaceae, Oleaceae, Apocyanaceae, Asclepiadaceae, Boraginaceae, Pedaliaceae, Acanthaceae, Lamiaceae, Polygonaceae, Nyctaginaceae, Loranthaceae and Euphorbiaceae

Suggested Readings:

Plant Taxonomy: Heywood, V.H. (1967), Edward Arnold (Publisher) Ltd. London.

Taxonomy of Vascular Plants: Lawrance, GH. M. (1951), The Mc Millan Co, New York.

An Introduction to Plant Taxonomy: Lawrance, GH. M. (1955), The Mc Millan Co, New York.

Classification of Vascular Plants: Rendle (1925), Cambridge Uni. Press, Cambridge.

Morphology of Angiosperm: Sporne (1925), Amazon. Co. UK.

Taxonomy of Angiosperm: Nail, V. N. (1984), TATA McGraw-Hill publishing Company Ltd.

MOB-105: Plant Resource Utilization

Unit: I

Perspectives of Plant Resource Utilization

Origin of cultivated plants and their domestication

Vavilov's centers of origin

Unit: II

Processing and uses of:

Fibre plants: Cotton and Jute

Spices: Black Pepper and Cardamom

Narcotics: Cocaine and Opium

Unit: III

Distribution, description and uses of:

Insecticides: Pyrethrum and Rotenone.

Timber yielding plants: *Tectona* and *Dalbergia*

Medicinal plants: *Cinchona* and *Ginseng*

Unit: IV

Properties and processing of Coffee and Tea

Mode of extraction of Para Rubber and Guayule

Ethnobotany: Scope and Interdisciplinary approaches of Ethnobotany in Folk medicine

Suggested Readings:

A Text Book of Economic Botany: A.V. S. S. Samba Murthy & N. S. Subramanyam (1989); Wiley Eastern Ltd., New Delhi.

Economic Botany- Plants in our World: B.B. Simpson & M. Conner-Ogorzaly (1986); Mc Graw Hill, New York.

The Useful Plants of India: K. Rama Chandran(1986); CSIR, New Delhi.

Cultural Use of Plants- A Guide to learning about Ethnobotany: G. D. Paye (2000), The New York Botanical Garden Press.

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A Manual of Ethnobotany: S. K. Jain (2004); Scientific Publishers, Jodhpur, India.

A Hand Book of Ethnobotany: S. K. Jain & V. Mudgal (1999), BSMPS.

Economic Botany in the Tropics: S. L. Kocchar (1981), Macmillan India Ltd., New Delhi.

Hill's Economic Botany: O.P. Sharma (1996), TATA McGraw-Hill publishing Company Ltd., New Delhi.

MOB-201: Plant Developmental Biology and Morphogenesis

Unit: I

Introduction definition and scope of morphogenesis

Totipotency, polarity, symmetry and differentiation

Arabidopsis as modal plant for the study of development biology

Unit: II

Microsporogenesis and structure of male gametophyte

Development and structure of pollen, abnormal features of pollen

Megasporogenesis and female gametophyte, type of ovule and embryo sac

Unit: III

Pollination, fertilization and double fertilization

Sexual incompatibility, method of overcoming incompatibility

Endosperm, its type, function and development

Unit: IV

Pattern of embryo development (Embryogeny); type of embryo, polyembryony, apomixes, parthenogenesis, parthenocarpy

Organ culture, anther, ovary and embryo culture and their applications

Embryology in relation to taxonomy

Suggested Readings:

An Introduction to the Embryology of Angiosperms: P. Maheshwari (1950)

Embryology of Angiosperms: B. J. Johri (1984)

Systemic Embryology of Angiosperms: S. L. Davis (1966)

The Embryology of Angiosperms: S. S. Bhojwani and S. P. Bhatnager

Development Biology (6th edition): Scott F. Gilbert

Plant Development al Biology- Methods and Protocols: Lars Hennig and Claudia Kohler

Introduction to Plant Biotechnology: H. S. Chawla

MOB-202: Plant Ecology

Unit: I

Introduction and scope of Ecology

Population ecology: Population attributes, Population Dynamics and its regulation, Energy partitioning and optimization (r and k selection)

Concept of ecads and ecotypes

Unit: II

Concept of community, analysis of communities (analytic and synthetic characters), Methods of analysis of communities, Niche, Ecological Succession: Causes, Types and mechanism, concept of climax

Unit: III

Ecosystem Ecology: Concept of ecosystem, structure and function of ecosystems, Primary, Secondary and Net Production, Energy flow, Biogeochemical cycles (nitrogen and phosphorus)

Unit: IV

Bio-Diversity: Concept and distribution, hotspots, Benefits and threats to biodiversity

Global issue in sustainability: Biological invasion and Biodiversity concerns (IUCN categories of Threat and conservation).

Suggested Readings:

Fundamental of Ecology: E. P. Odum(1996); Natraj Publishers.

Terrestrial Pant Ecology: M. G. Barbour, J. H. Burk and W. D. Pitts, Benjamin/ Cumming Publication.

Principle and Practices in Plant Ecology: K. M. M. Dakshni (1999); CRS, Boston.

Modern Concept of Plant Ecology: H. D. Kumar (1990); Vikas Publishing House Pvt. Ltd.

Text Book of Biodiversity: V. K. Krishnamurthy (2003), Science Publisher, Chennai.

Global Biodiversity Strategies: IUCN & UNEP.

MOB-203: Phytogeography and Soil Science

Unit: I

Basic principles of Phytogeography, Age and area Theory

Plant migration

Concept of endemism and categories

Unit: II

Vegetation and Botanical regions of India

Remote sensing: Definition and Data Acquisition Techniques

Application of Remote sensing in Vegetation Classification

Unit: III

Formation of Soil- Soil forming processes, factors and Soil types

Physical properties of Soil: Water Holding Capacity and Bulk density

Chemical properties of Soil: Acidity and Alkalinity

Unit: IV

Soil Erosion and Control

Wasteland: Types and causes of land degradation

Suggested Readings:

Soil and the Environment-An Introduction: Alan Wild (1996), Cambridge University Press.

Remote Sensing and GIS: B. Bhatta (2011); Oxford University Press.

Fundamentals of Remote Sensing: George Joseph (2005), University Press.

Introduction to Remote Sensing (3rd edition): J. B. Champbell (2002), The Guildford Press.

Manuals of Phytogeography: Leone Croizat (1952), W. Junk.

The Geography of Flowering Plants: R. Good (1947), Longmans.

Plant Biodiversity & Taxonomy: M. P. Singh, B. S. Singh and Som Dev (2002); Daya Publishing House, Delhi.

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Text Book of Soil Science: T. B. Biswas & S. K. Mukherjee (2001), TATA McGraw-Hill publishing Company Ltd., New Delhi.

Soil Science & Management: E. J. Plaster (1992), Delmar Publishers.

MOB-204: Tools Techniques and Biostatistics

Unit: I

Microscopy: Light, Phase Contrast, Confocal, Fluorescence, Scanning and Transmission Electron Microscopy

Centrifugation: Basic principle, types and application of Centrifugation

Unit: II

Chromatography: Basic Principles and Application, Types of Chromatography: Partition, adsorption, Ion, Exchange, TLC, Affinity, Gas Chromatography and HPLC

Spectroscopy: Basic Principles and Application of UV-VIS Spectrophotometry, Colorimetry, NMR, ESR and IR Spectroscopy

Unit: III

Electrophoretic Techniques: Principles and Application of SDS-PAGE and Agrose gel electrophoresis

DNA amplification & molecular markers: PCR, RT-PCR, RFLP, RAPD techniques

Unit: IV

Biostatistics: Measures of central tendency, Standard deviation, Chi-Square test, Student's t test, F-test, Correlation coefficient, Regression

Suggested Readings:

Principle and Techniques of biochemistry and Molecular Biology: K. Wilson and J. Walker (2010); Cambridge University Press.

Phytochemical Methods- A Guide to Modern Technique of Plant Analysis: J. B. Harborne (1998); Chapman & Hall, London, U. K.

Biochemical Methods: S. Saelasivam and A. Manikam (2005); New Age International Private Ltd., New Delhi.

Plant Proteomics: Techniques, Strategies and Applications: G. K. Agrawal and R. Rakwal (2008); Johan Wiley & Sons, New York, USA.

MOB-205: Microbiology

Unit-I

History and scope of Microbiology

Molecular approaches in microbial phylogeny

Ultrastructural details of eubacterial cell and general account of Archaeobacteria

Unit-II

Bacterial growth: Batch, Synchronous and Continuous culture; Kinetics

Nutritional requirements and modes of nutrition in Bacteria

Genetic recombination in Bacteria Conjugation, Transformation and Transduction

Unit-III

Lytic cycle, lysogenic cycle and its significance; one step growth curve

Sub viral entities (viroids, virusoids and prions)

Unit-IV

Improvement of industrially important microbial strains

Industrial production of Penicillin, Glutamic acid, Ethanol and biofuel cells

Plant growth promoting microorganisms

Suggested Readings:

Microbiology: R.P. Singh (2011); Kalyani Publication.

General Microbiology: R.Y. Ingraham, J. L. Wheelis, M. I. and Painter, P. R, The Macmillan Press Ltd.

Brock Biology of Microorganism: M. T .Martinko, J.M. and Parker, J. Prentice-Hall.

Microbiology: M. J. Pelczar, E. C. S. Chan and N. R. Kreig, Tata McGraw Hill.

Microbiology: Pesscott, Harley and Klein 8th edition; Mc Graw- Hill Higher Education.

Microbial Genetics: S.R. Malloy, J. E. Jr. Cronan and D. Freifelder, Jones; Barlett Publishers.

Microbiology-A Laboratory Manual: J. G. Cappuccino, N. Sherman and Addison Wesley; Pearsons Education, Singapur.

MOB-301: Plant Physiology

Unit: I

Water relations: properties of water, water in tissues and cells (water potential)

Uptake, translocation and water loss

Uptake and transport of ions across membrane (Passive and active transports)

Translocation of solutes

Unit: II

Evolution of Photosynthetic machinery

Photosynthetic pigments-Chlorophylls, Carotenoids, Phycobilins

Light absorption, excitation energy transfer, electron transfer Cycles and Photophosphorylation

Unit: III

CO₂ fixation-C₃, C₄, and CAM pathways

Respiration-Glycolysis, Kreb's cycle

Electron transport and oxidative phosphorylation

Alternative pathway of glucose oxidation: Pentose Phosphate Pathway (PPP)

Unit: IV

Cyanide resistant respiration-mechanism and significance

Photorespiration-mechanism and significance

Mode of action and physiological effect of Auxins and Gibberellins

Suggested Readings:

Plant Physiology: L. Taiz and E. Zeiger (2003); Sinava Associates Inc. Publishers, Sunderland MA.

Plant Physiology: F. B. Salisbury and C. W. Ross (1992); Words Worth Publication Co. Belmon, California.

Plant Physiology: W. Hopkins; John Wiley and Sons. Inc, NY.

Photosynthesis- Comprehensive Treatise: A. S. Raghavendra (Ed) (1998); Cambridge University Press.

MOB-302-Plant Biochemistry

Unit: I

Laws of thermodynamics, entropy, enthalpy, concept of free energy and redox potential

Energy rich phosphorous compounds, ATP as universal currency of energy

β - oxidation of saturated fatty acids

Unit: II

Biosynthesis of starch and sucrose in plants

Biosynthesis of fatty acids and membrane phospholipids

Primary, secondary and tertiary structure of protein, protein folding and unfolding, Ramachandran plot

Unit: III

General aspects of prosthetic group and coenzymes, mechanism of enzyme catalysis, factors effecting enzyme activity, Michaelis- Menten kinetics

Enzyme inhibition, regulatory enzymes and ribozymes

Nitrate assimilation in plants

Unit: IV

Biosynthesis of phenylpropanoids and opium alkaloids

Role of secondary metabolites (flavonoids, isoflavonoids, anthocyanins, terpenoids and alkaloids) in defense system of plants

Suggested reading:

Principles of Biochemistry: G. L. Zubay, W. W. Parson and D. E. Vance (1995); Win. C. Brown Publishers, Australia.

Biochemistry: L. Stryer, J. M. Berg, J. L. Tymoczko (Eds) (2006); W. H. Freeman and Company, New York.

Lehninger Principles of Biochemistry: D. L. Nelson and M. M. Cox (Eds) (2007); W. H. Freeman and Company, New York.

Plant Biochemistry: J.B. Horborneb (Ed) (2000); Champman and Hall, London, UK.

Biochemistry and Molecular Biology of Plants: B.B. Buchanan, W. Gruissem and R. L. Jans (Eds) (2000); I. K. Internatioal Pvt. Ltd., New Delhi

MOB-303: Plant Molecular Biology

UNIT: I

DNA: Structure and chemical composition

DNA replication in prokaryotes and eukaryotes

DNA damage and repair

UNIT: II

Structure of RNA

RNA synthesis (transcription) in prokaryotes and eukaryotes

RNA processing in eukaryotes

Reverse transcription

UNIT: III

Genetic code

Protein synthesis (Translation) in prokaryotes and eukaryotes

Inhibition of protein synthesis

UNIT: IV

Regulation of gene expression in prokaryotes: lac operon, trp operon

Regulation of gene expression in eukaryotes

Role of DNA methylation: enhancer's, promoters and co activators in regulation of gene expression

Suggested reading:

Molecular Biology of Gene: J. D. Watson e. al. (5th edition) (2009); Pearson Education; Inc.

Cell and Molecular Biology- Concept and experiments: Gevald Karp (4th Edition) (2005); John Wiley and Sons, Inc.

Genomes 2: T. A. Brown (2002); John Wiley and Sons, Inc.

Principles of Genetics: D. P. Snustad and M.J. Simmons (2009); Wiley Publication, Inc.

Gene-VIII: Benzamine Lewin (2004); Pearson Prentic Hall.

MOB-304: Genomics, Proteomics and Bioinformatics

Unit-I

Organization of prokaryotic and eukaryotic genome, linkage maps and physical maps

DNA sequencing (Sanger method)

Unit-II

Molecular markers and their application: SSRs, and SNPs. Detection and mapping of quantitative trait loci (QTLs)

Unit-III

Proteome, Tools for proteome analysis-Mass spectrometry (MALDI-TOF)

Protein sequence databases: Gene, Uniport, Swissprot and PIR

Homology modeling of Proteins and albino method for structure prediction

Unit-IV

Introduction to Bioinformatics: Databases: Types of Database, DNA sequences and Protein sequences, Database sequence comparison and alignment techniques

Tools for sequence alignment (FASTA and BLAST)

Phylogenetic analysis: Concept of trees (Clustal analysis)

Suggested reading:

Gene IX: B. Lewin(2008); Peterson Publication/ Panima.

Lehninger principles of Biochemistry: D. L. Nelson and M. M. Cox (Eds) (2007); W. H. Freeman and Company, New York.

Discovering Genomics, Proteomics and Bioinformatics: A. M. Campbell and L. J. Heyer (2006); CSHL Press, New York.

Introduction to Proteomics- Tools for new Biology: D. C. Lieber (2002); Humana Press, New Jersey, USA.

Sequence and Genome analysis: W. M. David (2004); CSHL Press, New York.

Bioinformatics- A Practical Approach: K. Mani and N. Vijayarang (2004); Aparna Publication.

MOB-401: Stress Physiology

Unit-I

Water stress (drought and water deficit)

Stomatal response to water stress-Role of abscissic acid (ABA)

Photosynthesis and water stress

Osmotic adjustment

Mechanism of drought tolerance

Unit-II

Temperature stress

Membrane and chilling injury

Killing of cells by freezing

Acclimation to freezing

Resistance and tolerance to freezing temperatures

Unit-III

Heat stress and heat shock

Cellular responses to high temperature-enzyme activities, photosynthesis, Ultra structural effect

Molecular responses to high temperature

Heat shock proteins

Adaptation to protect leaves against excessive heating

Unit-IV

Salt stress- water stress, nutrient ion deficiency, ion toxicity

Regulation of salt concentration-Salt elimination, Salt succulency

Mechanism of salt resistance and tolerance

Suggested reading:

Plant Ecophysiology: M. N. V. Prasad (Ed.) (1997); John Wiley and Sons, Inc. NY.

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Encyclopedia Plant Physiology: New Series, 12 ABCD Plant Physiology Ecology (1983), Springer Verlag Berlin.

Plant Cellular and Molecular Responses to high salinity: P. M. Hasagenia and A. B. Ray (2000); In Annual Review, *Plant Physiology and Molecular Biology*.

Response of Plants to Environmental Stress Vol I & II: J. Levitt (1980); Academic Press, New York.

Physiological Plant Ecology: Walter Larcher (1995); Third Edition; Springer.

MOB-402- Plant Biotechnology

UNIT- I

Concept and scope of biotechnology

Gene manipulating enzymes: Nucleases, Ligases and Polymerases

Cloning vectors: Plasmids, Phages, Cosmids, Phasmids, Transposons and YAC's

Gene cloning: C DNA cloning and shot gun cloning, gene library

UNIT- II

Southern, Northern and Western blotting techniques

Screening and identification of recombinant clones

Application of Genetic Engineering in Medicine/ drugs development and crop improvement

Methods of Gene transfer in crop plants

Transgenic plants

UNIT- III

History of cell and tissue culture

Tissue culture media, callus culture and suspension culture, micropropagation and organogenesis.
Somaclonal variations

UNIT- IV

Isolation, culture and fusion of protoplasts, regeneration of somatic hybrids and cybrids

Somatic embryogenesis; Synthetic seeds; Organ culture; Production of Haploids and their uses;
Biotransformation

Suggested reading:

Principles of Gene Manipulation and Genomics: S. B. Primrose and R. M. Twyman; 7th Edition (2006); Black well Publications.

Genomes 2: T. A. Brown (2002); John Wiley and Sons, Inc.

Gene Cloning and DNA Analysis: T. A. Brown (2009).

Plant Tissue Culture- Theory and Practice: S. S. Bhojwani and M. K. Razdan (2005).

Introduction to Plant Tissue Culture: M. K. Razdan (2003).

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Plant Biotechnology in Agriculture: K. Linsey and M. G. K. Jones (2002).

MOB-403: Cytogenetics and Plant Breeding

Unit-I

Cell division - mechanism, types, their regulation and significance

Cell cycle and its control

Unit-II

Principle of Mendelian inheritance: segregation and independent assortment, multiple alleles

Lethality, Quantitative inheritance

Linkage, crossing over and chromosome mapping

Unit-III

Mutation: types, chemical and physical mutagens, mutation at molecular level

Population genetics

Modern concept of gene

Unit-IV

Inbreeding depression: hybrid vigour and its significance in crop improvement

Alien gene transfer through chromosome

Numerical variation in chromosome, role of polyploidy in crop improvement

Suggested reading:

Plant Cytogenetics: Ram J. Singh; CRP Press, Florida, USA.

Dictionary of Plant Breeding: Rolf H. J. Schlegel; CRP Press, Florida, USA.

Cytogenetics in Plant Breeding: Jacob Sybenga; Springer- Verlag Publications.

Reviews in Plant Cytogenetics: M. J. Puertas and J. Naranjo; KARGER Publications, Switzerland.

Plant Breeding and Cytogenetics: F. C. Elliott; McGraw Hill, USA.

Cytogenetics and Plant Breeding: S. N. Chandrasekharan; Madras, P. Varadachary Publications.

Cytogenetics: An Advance Study: P. K. Gupta; Rastogi Publication, Meerut.

Cytogenetics, Evolution and Plant Breeding: R. S. Shukla and P. S. Chandel; S. Chand and Company.

MOB-404(A): Environmental Biology

Unit-I

Scope and approaches of Environmental Biology

Environment and its components: Atmosphere, Hydrosphere, Lithosphere and Biosphere

Conservation of wild life (*in situ* and *ex situ* methods)

Unit-II

Environmental monitoring: definition, Observation and benefits

Occupational and general environmental monitor's

Concept of biological indicators

Environmental laws

Unit-III

Global Warming: Mechanism of Green House Effect, causes and consequences

Ozone layer depletion and UV-B irradiation effects

Photochemical Smog- mechanism and effects

Unit-IV

Water Pollution: Sources and effects on Ecosystem

Soil Pollution with special reference to pesticides and fertilizers

Heavy metal pollution

Suggested reading:

Environmental Biology: Roy Sovan (2003); Publishing Syndicate, Kolkata.

Biodiversity Monitoring and Utilization: S. K. Banerjee and T. K. Mishra (2013); Avishkar Publishers Distributors, New Delhi.

Biodiversity and its Conservation in India: S. S. Negi (2008); Indus Pub., New Delhi.

Fundamental of Ecology: E. P. Odum (1996); Natraj Publisher, Deheradun.

MOB-404(B): Plant Pathology

UNIT: I

History of plant pathology; socio-economic impact of plant diseases

Concept and classification of diseases; disease cycle; Koch's postulates

Modes of infection and attack by the pathogen

UNIT: II

Host Defense mechanism against pathogen

Pathogen dissemination; Plant disease forecasting

Principles of plant disease management with emphasis on chemical treatment, biological control and resistant variety production

UNIT: III

Late blight of potato, Downy mildew of crucifers and bajra, White rust of crucifers, Stem gall of coriander, Powdery mildew of pea, Leaf spot of turmeric, False or green smut of rice, Rust of pea and linseed, Loose smut of wheat

UNIT: IV

Leaf spot of crucifers, Tikka disease of groundnut, Early blight of potato, Wilt of arhar, Red rot of sugarcane.

Citrus canker, Tundu disease of wheat, Potato leaf roll disease, Leaf curl of papaya, Tungro disease of rice, Yellow vein mosaic of bhindi, Little leaf of brinjal, Sugarcane ratoon stunting.

Suggested reading:

Plant Pathology: G. N. Agrios.

Plant Pathology: R. P. Singh.

Plant Pathology: R. S. Mehrotra.

Plant Diseases: R. S. Singh.

Diseases of Crop Plants in India: G. Rangaswami.