SYLLABUS

M.SC. BOTANY

Semester -1	Full nomenclature of paper	Max. Marks	Credits/ hrs.
BOT-101	Cell biology	80	4
BOT-102	Tools & Techniques	80	4
BOT-103	Biology and diversity of Viruses Bacteria & Fungi	80	4
BOT-104	Biology and Diversity of Algae, Bryophytes & Pteridophytes	80	4
BOT-105	Plant Gentics	80	4
	Laboratory Course-I	150	20
	Seminar - 1	50	1
	Internal Assessment	20 in each theory paper	1

Total Marks (Semester-1) 700

Semester -I1	Full nomenclature of paper	Max. Marks	Credits/ hrs.
BOT-106	Molecular biology of Plants	80	4
BOT-107	Plant Breeding an Cytogenetics	80	4
BOT-108	Biology and diversity of Gymnosperms	80	4
BOT-109	Taxonomy of Angiosperms	80	4
BOT-110	Evolutionary and Economic Botany	80	4
	Laboratory Course-II	150	20
	Seminar - II	50	1
	Internal Assessment	20 in each theory paper	1

Total Marks (Semester-II) 700

Semester -III	Full nomenclature of paper	Max. Marks	Credits/ hrs.
BOT-111	Plant Physiology	80	4
BOT-112	Ecology-I	80	4
BOT-113	Plant Development	80	4
BOT-114	Plant Biotechnology-I	80	4
BOT-115	Biostatistics and Computers	80	4
	Laboratory Course-III	150	20
	Seminar - III	50	1
	Internal Assessment	20 in each theory paper	1

Total Marks (Semester-III) 700

Semester -IV	Full nomenclature of paper	Max. Marks	Credits/ hrs.
BOT-116	Plant Metabolism	80	4
BOT-117	Ecology-II	80	4
BOT-118	Plant Reproduction	80	4
BOT-119	Plant Biotechnology-II	80	4
BOT-120	Plant Pathology	80	4
	Laboratory Course-IV	150	20
	Seminar - IV	50	1
	Internal Assessment	20 in each theory paper	1

Total Marks (Semester-IV) 700

M.SC. BOTANY
SEMESTER - III

M.M. : 80

Time : 3 Hrs.

BOT-111 - Plant Physiology

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Membrane transport and translocation of water and solutes : Plant-water relations, mechanism of water transport, root-microbe interactions for nutrient uptake.

Comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport, Stomatal physiology.

Unit - 2

Sensory Photobiology : History, discovery and properties (photochemical and biochemical) of phytochromes and crytochromes.

Photophyisology of light- induced responses;cellular localization; molecular mechanisms of action of photomorphogenic receptors. Flowering Process : Photoperiodism and its significance, Endogenous clock and its regulation; Floral induction and its development : Role of vernalization.

Unit - 3

Plant growth regulators and eleicitors : Biosynthesis, Types, Physiological effects & Mechanisms of action of Promoters; Auxins,. Cytokinins, Gibberellins, Brassinosteroids and inhibitors; Abscisic acid Jasmonic acid, Ethylene. Concepts of promotion & inhibitions.

Unit- 4

Stress Physiology : Type of stresses, Plant responses and mechanisms of tolerance of biotic and abiotic stresses; HR and SAR; Water deficit and drought resistance, Salinity stress; metal toxicity; freezing and heat stress; oxidative stress. Chem ical modulation and Biotechnological approaches for tolerance in plants. Molecular biology of stress tolerance, Genetic Engineering in stress tolerance. Concept of Pollutants fertilizer : N & S oxides.

M.SC. BOTANY
SEMESTER - III

M.M. : 80
Time : 3 Hrs.

BOT-112- Ecology

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Climate, Soil and Vegetation pattern of the world :Life zone; major biomes; and soil types of the world

Concepts of community and continuum; Analysis of communities (analytical and synthetic characters); community coefficients; interspecfic association; concept of ecological niche.

Unit - 2

Vegetation Development : Temporal changes (cyclic); Ecological succession.

Models and mechanisms of ecological succession- Relay floristic; facilitation; tolerance and inhibition models.

Unit - 3

Ecological organization : Structure and functions; Primary production - Methods of measurement, global pattern and controlling factors.

Energy dynamics ; Energy flow ; pathways; ecological efficiency; food chain, food web and trophic levels; Ecological pyramids and recycling.

Unit- 4

Litter fall and decomposition : Mechanisms, substrate quality and climate factors associated with decomposition.

Biogeochemical Cycles ; Mineral cycles in terrestrial and aquatic eco system ; H_2O, Carbon, Nitrogen, Phosphorous and Sulpher cycles.

M.SC. BOTANY
SEMESTER - III

M.M. : 80
Time : 3 Hrs.

BOT - 114 Plant Biotechnology-I

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Introduction : Basic concepts, princplies and scopes of Biotechnology.

Plant tissue culture : General introduction; history; concept of cellular differentiation; totipotancy.

Unit - 2

Organogenesis and adventive embryogenesis; Fundamental aspects of morphogenesis. Somatic embryogenesis and androgenesis : Mechanisms, techniques and utility.

Unit - 3

Somatic hybridization : Protoplast isolation, fusion and culture; hybrid selection and regeneration.

Possibilities, achievements and limitation of protoplast research.

Unit- 4

Application of plant tissue culture in :

a. Clonal propagation

b. Artificial seeds

c. Production of hybrids and somaclones

Application of plant tissue culture in :

d. Production of secondary metabolites / natural products

e. Cryopreservation and germplasm storage.

M.SC. BOTANY

SEMESTER - III

M.M. : 80

Time : 3 Hrs.

ENV - 115 Biostatistics and Computers

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Biostatistics : Graphical representation of data ; Analysis of variation; Analysis of frequencies; Measures of central tendency; variation coefficient of variation.

Correlation and regression; Hypothesis testing; Experimental design and sampling theories

Unit - 2

Probabilities theory; t-test, F-test and X^2 test; Probability distributions and their properties.

Non- parametric test :Sign test; Run & Median test; Wilcoxon Signed Rank Mannwhiteney test; Kruskal Wallis test.

Unit - 3

Computers : Components and functions; generations of computers; input and output devices ; types of memory; file manager; internet and its applications.

Operating system and its evolution; system and application software; internal and external commands of DOS, UNIX WIN 98/ 2000/ XP; Office applications including MS- Word, MS-Excel, MS-Powerpoint.

Unit- 4

Bioinformatics : Introduction and uses of bioinformatics tools -

a. BLAST

b. FASTA

c. Multiple sequence alignment - CLUSTAL-W

d. MEDLINE & PubMED

Retrieving and installing a programme (Tree Tool) ; Searching Science Citation Index & current content ; Accessing full text Journal.

M.SC. BOTANY
SEMESTER - IV

M.M. : 80

Time : 3 Hrs.

BOT - 116 Plant Metabolism

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Energy flow : Principles of thermodynamics ; free energy;chemical potential; redox reactions; Structure and functions of ATP.

Fundamentals of enzymes; General aspects, allosteric mechanism, regulatory and active sites; isozymes; enzyme kinetics; Michaelis - Menten equation and its significance.

Unit - 2

Signal Transduction : Overview; receptors and G- proteins; phospholipids signaling; role of cyclic nucleotides; calcium- calmodulin cascade.

Diversity in protein kinases and phosphatases, specific significance mechanisms - Two component system in bacteria and plants.

Unit - 3

Photochemistry and photosynthesis ; General concepts and histroical background evolution of photosynthesis apparatus; photosynthesis pigments and light harvesting complexes; photooxidation of water; Calvin cycle.

Photorespiration and its significance; C_4 cycle; CAM pathway; C2 cycle, biosynthesis of starch and sucrose.

Unit- 4

Respiration and lipid metabolism : Glycolysis; TCA cycle; Electron transport and ATP synthesis; Pentose phosphate pathway (PPP); Glyoxylate cycle; Structure, biosynthesis and functions of lipids; Catabolism of structural and storage lipids.

Nitrogen fixation and N & S metabolism ; Overview; biological nitrogen fixation; nodule formation and factors; mechanism of nitrate uptake and reduction; ammonium assimilation; Sulfate uptake, transport and assimilation.

M.SC. BOTANY

SEMESTER - IV

M.M. : 80

Time : 3 Hrs.

BOT - 117 Ecology-II

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Biological diversity : Concept; status in India; role of biodiversity in ecosystem functions and stability; hot spots; inventory; Speciation and extinction; IUCN categories of threat. Environmental education; information and environmental health; environmental status of plants based on IUCN.

Unit - 2

Air, Water an soil Pollution : Kinds; sources; quality parameters; effects on plants and ecosystem.

Climate change : Greenhouse gases (CO_2 CH_4, N_2O, CFCs); Ozone layer and hole ; Global warming.

Unit - 3

Ecosystem dynamics & management ; Major ecosystems; Stability and complexity of exosystem; Habitat ecology; Environmental impact assessment (EIA); ecosystem restoration.

Ecological management : Concept sustainable development; sustainability indicators; Ecotourism and Biosafety; Remote sensing; Environmental problems in India.

Unit - 3

Biodiversity : Definition, Status : National & Global, Issues of Biodiversity. *in-situ* conservation : protected areas in India -Wild-life sanctuaries; National parks; Biosphere reserves; Wetlands; Mangroves; and Coral reefs.

Biodiversity *ex-situ* conservation : Botanical gardens; Field gene banks; Seed banks; *in vitro* repositories; and Cryobanks N.B.P.G.R.

SEMESTER - IV

M.M. : 80

Time : 3 Hrs.

BOT- 118 Plant Reproduction

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Male gametophyte ; Structure of anther; microsporogenesis; role of tapetum; pollen development and gene expression; male sterility.

Unit - 2

Female gametophyte ; Ovule development; megasporogenesis;organization of embryosac; structure of the embryo sac cells, Pollination - Mechanisms and vectors; pollen pistil interaction and fertilization.

Breeding systems; structure of the pistil Self incompatibility - SSI and GSI (cytological, biochemical and molecular aspects); Double fertilization; *in-vitro* fertilization.

Unit - 3

Seed development ; Endosperm development during early maturation and desiccation stages; embryogenesis - ultrastructure and nuclear cytology.

Cell lineages during late embryo development; Storage proteins of endoperms and embryo; Polyembryony; Apomixis; Embryo culture.

Unit- 4

Fruit growth : Dynamics of fruit growth; Biochemistry and molecular biology of fruit maturation.

Dormancy : Importance and types of dormancy; seed dormancy; bud dormancy; overcoming seed dormancy.

M.SC. BOTANY

SEMESTER - IV

M.M. : 80

Time : 3 Hrs.

BOT- 119 Plant Biotechnology-II

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Recombinant DNA technology : Gene cloning - principles and techniques; Choice of vectors- plasmids, bacteriophage, phagemids and eukaryotic vectors.

Construction of genomic and cDNA libraries; DNA synthesis and sequencing.

Unit - 2

Genetic engineering of plants : Aims, Strategies for development of transgenic (with suitable examples) *Agrobacteraium* - the natural genetic engineer; Transposon mediated gene tagging.

Chloroplast transformation and its utility; Intellectual property rights, possible ecological risks and ethical concerns.

Unit - 3

Microbial genetic manipulation; Bacterial transformation; selection of recombinants and transformants.

Genetic improvements of industrial microbes and nitrogen fixer, fermentation technology.

Unit- 4

Genomics and Proteomics : Molecular markers for introgression of useful traits; Artificial chromosomes; High throughoput sequencing; genome project.

Functional Genomics; Microarrays : Protein profilling and its significance; Application of genetic engineering in agriculture, health and industry.

M.SC. BOTANY
SEMESTER - IV

M.M. : 80

Time : 3 Hrs.

BOT - 120 Plant Pathology

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus, will be compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting one from each section.

Unit - I

Fundamentals of plant pathology ;History of plant pathology ; Various levels of parasitism; Calssification of plant diseases.

Pathogenesis :Penetration and entry ofplant pathogens; development inside host tissue.

Unit - 2

Agents of plant diseases General chacarteristics and symptoms caused by - agents of infectious diseases (fungi, bacteria, mycoplasma, virus and nematodes) and Agents of non- infectious diseases (air pollution, chemicals, minerals excess, temperature).

Enzymes and toxins in plant diseases.

Unit - 3

Plant Disease : Causal organisms, symptoms and management of-

a. Downy mildew of grapes.

b. Karnal bunt of wheat

c. Smut of Bajra

d. Late and early blight of potato

Plant Disease : Causal organisms, symptoms and management of -

e. Yellow vein mosaic of Bhindi

f. Tikka disease of groundnut

g. Bacterial blight of paddy

h. Black rust of wheat

i. Sandal spike.

Unit- 4

Defense Mechanism in plants ;Structural, Induced and Biochemical defense mecahnisms; Hypersensitivity reaction.

Detoxification of pathogen toxing : Application of molecular biology in disease control strategies.

Maharshi Dayanand University
Rohtak

Ordinance, Syllabus and Courses of Reading for M.Sc. Botany (3rd & 4th Semester) Examination

Session - 2009-2010

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