

UNIVERSITY OF MYSORE
Established: 1916

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysore-570 005
Dated: 18.08.2021

No.AC.2(S)/151/2021-22

NOTIFICATION

Sub: Minor changes in the Scheme of Examination of Botany (PG) for the academic year 2021-22.

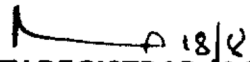
- Ref:** 1. Decision of Board of Studies in Botany (PG) meeting held on 30.11.2020.
2. Decision of the Faculty of Science & Technology Meeting held on 08.02.2021.
3. Decision of the Academic Council meeting held on 07.04.2021.

The Board of Studies in Botany (PG) which met on 30.11.2020 has approved the Scheme of Examination for HC 1.3: Systematic of Angiosperm, HC 3.1: Biochemistry and Plant Physiology, HC 3.2: Molecular Biology and HC 3.3: Plant Breeding and Evolutionary Biology in the Scheme of Examination of Botany (PG) for the academic year 2021-22.

The Faculty of Science and Technology and Academic Council meeting held on 08.02.2021 and 07.04.2021 respectively have approved the above said proposal and the same is hereby notified.

The detailed changes in the Scheme of Examination of Botany (PG) course is annexed. The contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

DRAFT APPROVED BY THE REGISTRAR


DEPUTY REGISTRAR (ACADEMIC)
Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

To:

1. The Registrar (Evaluation), University of Mysore, Mysore.
2. The Dean, Faculty of Science & Technology, DoS in Psychology, MGM.
3. The Chairperson, DoS in Botany (PG), Manasagangotri, Mysore.
4. The Deputy/Assistant Registrar/Superintendent, AB and EB, UOM, Mysore.
5. The P.A. to the Vice-Chancellor/Registrar/Registrar (Evaluation), UOM, Mysore.
6. Office file.

ANNEXURE –I

Minor changes in the course content:

BOTANY: III- SEMESTER - HARD CORE 3.1 TAXONOMY OF ANGIOSPERMS

UNIT-I: Introduction to plant systematics; Plant classification systems-artificial, natural and phylogenetic systems; Contributions of Carolus Linnaeus, Michel Adanson, de Jussieu, de Candolle to plant classification; Concepts of taxonomic hierarchy; Taxonomic Categories- Genus concept; Species concept; Intraspecific categories; subspecies; varieties and forms; History of botanical nomenclature; ICBN and ICN aims and principles; Rules and recommendations; Rule of priority; Typification; Author citation, Legitimate and illegitimate names; Name changes and synonyms; Effective and valid publication; Herbarium and its significance; Botanical gardens.

UNIT-II: Taxonomic Literature: General taxonomic indices, world floras and manuals; Monographs and revisions; Bibliographies, catalogues and reviews; Periodicals, glossaries and dictionaries; Hortus Malabaricus; Taxonomic websites- IPNI, Plant List, Tropicos, Botanico-Periodicum-Huntianum (BPH); Biodiversity Heritage Library (BHL); Botanicus, Index Herbariorum; Taxonomic Keys- bracketed keys, indented keys, numbered keys, edge punched and body punched keys.

UNIT-III: Study of plant classification Systems; Broad outlines of Bentham and Hooker's system, Engler and Prantl's system, Hutchinson's system, Takhtajan's system, and Cronquist's system; Numerical Taxonomy-principles, selection of characters, merits and demerits; Angiosperm Phylogeny Group (APG) III & IV classification; Study of angiosperm families-Magnoliaceae, Nymphaeaceae, Urticaceae, Droseraceae, Podostemaceae, **Orobanchaceae**, Balanophoraceae, Loranthaceae, Alismataceae, Cyperaceae, Commelinaceae, Dioscoreaceae and Orchidaceae.

UNIT-IV: Molecular Systematics: Nuclear, mitochondrial and chloroplast genes. Genes sequencing, analysis of molecular data, alignment of sequences; Phylogenetic tree Construction-Maximum Likelihood and Neighbour Joining Methods; Phylogenetic analysis- rooted and unrooted trees; Data analysis- alignment, substitution, model building; Phylogenetic softwares-CLUSTAL W, MEGA, Mesquite, PAUP, PHYLIP, Treefinder, TreeBase.

Practicals

1. Methods of preparation and maintenance of Herbaria.
- 2-4) A field trip of three days to a floristically rich area to study plants belonging to different families (Every student shall submit a report for evaluation for two credits).
- 5-10) Identification of the flowering plants in and around Mysore using keys, floras and monographs.
- 11-12) Construction of phylogenetic tree based on molecular data of plant species retrieved from GenBank.

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BOTANY: III- SEMESTER - HARD CORE 3.1 BIOCHEMISTRY AND PLANT PHYSIOLOGY

Unit-1: Biochemistry- Brief account of plant structural and functional molecules- carbohydrates, proteins, lipids and nucleic acids; classification, structural and functional properties of biomolecules; Biochemistry of cell membranes; **Lipids-** building and storage molecules, classification and significance; **Proteins-** classification, structure- primary, secondary, tertiary and quaternary structure; properties of proteins; **Enzymes-** Nomenclature, nature and properties of enzymes, active sites, co-enzymes, kinetics of enzyme action, catalysis, specificity and inhibition, allosteric enzymes, ribozyme and abzyme.

Unit-2: Solute transport: Transport of solutes across the membranes Transmembrane proteins, Transport of ions, solutes and macro-molecules, Mechanism of translocations in phloem; Role played in signal transduction pathway stomatal physiology; **Phytosynthesis in higher plants** (i) Photophosphorylation – Calvin cycle; **Photorespiration** - C4 – Pathway, CAM in plants; Oxidative Phosphorylations; Glycolysis -TCA – Cycle and terminal oxidation.

Unit-3: Plant Hormones- plant hormones-discovery, biosynthesis, metabolism, transport and physiological effects of plant hormones and their applications; **Nitrogen metabolism** -(i) Molecular mechanism of N₂ fixation (ii) Biosynthesis of amino acids (iii) Assimilation of nitrate and ammonium; **Lipid metabolism-** fats and oils biosynthesis and oxidation of lipids; Physiology of seed germination and flowering.

Unit -4: Stress Physiology: Water deficit and its physiological consequences; Drought tolerance mechanisms, Salinity stress and plant responses. Heat stress and heat shock proteins; Metal toxicity in plants. Biotic stress, HR and SAR mechanisms; **Mineral nutrition-** in plants and deficiency diseases; **Plant development-** physiology of flowering; Phytochrome photochemical and biochemical properties of phytochrome; Concept of photoperiodism and vernalization and its influence on flowering;

Practicals-32 Hrs

- 1) Estimation of protein by Lowry's method
- 2) Determination of water potential of tissue by plasmolytic method
- 3) Determination of water potential by Gravimetric method
- 4) Quantitative estimation of chlorophyll a, chlorophyll b and total chlorophyll in plant tissue
- 5) Determination of diurnal fluctuation of acid content of CAM plants (TAN)
- 6) Determination of temperature quotient (Q₁₀) of water uptake
- 7) Separation of chlorophyll pigments/Anthocyanin by TLC
- 8) Protein analysis by SDS PAGE method.
- 9) Estimation of Alpha-amylase activity in germinating seedling.

- 10) Silver staining of proteins.
- 11-12) Visit to Molecular Biology Laboratories.

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BOTANY: III- SEMESTER - HARD CORE 3.2
MOLECULAR BIOLOGY

Theory-32 Hrs

Unit-1: Organization of chromosomes and genes in prokaryotes and eukaryotes -

Operon, interrupted genes, gene families, unique and repetitive DNA, heterochromatin, euchromatin, transposons, mitochondrial and chloroplast genome organization, Transposable elements in prokaryotes and eukaryotes, genetic and evolutionary significance, **DNA replication-** patterns, Messelson and Stahl's and Taylor's experiment, enzymes of replication, mechanism of DNA replication in prokaryotes and Eukaryotes, proof reading and error correction mechanisms.

Unit-2: Molecular mechanism of mutation, repair and recombination:- Mutation-

DNA Damage by spontaneous mutations, physical and chemical mutagens and their molecular mechanisms, **Repair mechanisms-** direct reversal of damage, base and excision repair, **mismatch repair**, recombinational repair, SOS repair, translation repair synthesis, transcription coupled repair, **Recombination-** homologous recombination, models of recombination, mechanisms, protein machinery of homologous recombination, genetic consequence of homologous recombination, gene conversion, site specific recombination, mechanism and biological significance, nonhomologous recombination- transposition, molecular mechanisms of transposition conservative, replicative and retro-transposition.

Unit-3: RNA synthesis, processing and translation: transcription activators and

repressors, promoters, RNA polymerases and transcription factors, mechanism of transcription in prokaryotes and eukaryotes, RNA processing- capping, polyadenylation, splicing, alternative splicing, RNA editing, exon shuffling and RNA transport, Translation and processing ribosomes, tRNA aminoacylation, aminoacyl tRNA synthetase, genetic code, wobble hypothesis, deciphering of the code, translation mechanism, translation proof reading, translation inhibitors and post translational modifications.

Unit-4: Regulation of gene expression in Prokaryotes: Operon concept, regulation at

transcription initiation- lac and trp operon control, regulation of lytic and lysogenic cycles in lambda phage, regulation beyond transcription initiation-premature termination- trp operon, ribosomal proteins as translational repressors, riboswitches, **Regulation of gene expression in eukaryotes-**transcription activators and repressors, regulation after transcription initiation alternative splicing, translational control in ferritin and transferrin mRNA, RNA interference, role of chromatin in regulation of gene expression and gene silencing.

Practicals-32 Hr

1) Isolation of DNA from CTAB method.

- 2) Isolation of DNA from Onion.
- 3) Isolation of DNA from mulberry leaves.
- 4) Isolation of DNA from cauliflower
- 5) Isolation of DNA from coconut endosperm
- 6) Estimation of RNA by Orcinol method
- 7) Estimation of DNA by DPA method.
- 8) Extraction of RNA by trizol/ phenol-chloroform methods.
- 9) Estimation of proteins by Biuret method.
- 10 Estimation of protein by Bradford method.
- 11) Determination of T_m value of DNA.
- 12) Photo graphs/ charts related to Molecular biology/Molecular Biologists.

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BOTANY: II SEMESTER HARD CORE 2.3

PLANT BREEDING AND EVOLUTIONARY BIOLOGY

Theory-32 Hrs

Unit-1: Introduction: Evolution of plant breeding, Objective and role of plant breeding; Scope of plant breeding, Sciences related to plant breeding; Recent trends in plant breeding. Vavilov's concept of origin of centers of origin of crop plants; Plant introduction and acclimatization; Domestication and agriculture. **Breeding Methods-Self pollinated crops:** Mass, Pure line, Pedigree, Bulk and Back cross methods. **Cross pollinated crops:** Progeny, Recurrent selection, Heterosis breeding synthetic and composite varieties and Clonal selections. **Breeding Techniques-**Mutation breeding, Polyploidy, hybridization, Tissue culture techniques in crop improvement, protoplast fusion, electrophoration, electro-fusion, biolistics, somatic hybridization, transgenic plants (GMO's); The role of Gene technology in plant breeding.

Unit-2: Breeding for Specific Purposes: Breeding for Disease resistance, Insect resistance, Drought and Salinity, Quality trait, Multiple cropping systems, Ideotype breeding, breeding for Adaptation; **Crop breeding and seed production-** Breeding field crops, seed production techniques, release of new varieties, intellectual property rights, computer application in plant breeding, crop breeding Institutes/Centers; Genetic resources and germplasm conservation; Scientific Plant breeding; Green revolution; The elite crop (Golden rice); Contributions of **Dr. M.S. Swaminathan**, **Dr. Norman E. Borlaug** and **N.I. Vavilov**.

Unit-3: Nature of Evolution : The origin, theories of evolution of life, earth and the universe; Conditions of the early earth, emergence of the first living cell, origin of prokaryotic and eukaryotic cells, life in the Palaeozoic, Mesozoic and Coenozoic era. **Development of Evolutionary thoughts;** Ecological context, before Darwin, Darwinism, Darwin's evolutionary theory, Neo – Darwinism, modern synthesis: **Fossil evidence of Ancient life**, fossilization; Interpreting geological time scale and fossil records; Evidences from comparative, morphology, patterns of development, comparative physiology and biochemistry, biogeography, palaeontology, taxonomy, anatomy and embryology, plant and animal breeding; Evidence from changing earth and sea; Extinctions; Evolutionary ecology.

Unit-4: Natural Selection : Types of natural selection, selective forces, selection models, sexual selection, selection and non adaptive characters, Adaptive radiation, artificial selection, **Variation-** gene flow, genetic drift, gene mutation - Mendelian concept, chromosomal mutation, architectural changes in chromosomes; The Hardy – Weinberg law, polyploidy in plant evolution; Speciation and origin of higher categories -Types of speciation, models of speciation,

pattern of speciation, isolating mechanism and species formation, signification of speciation; Molecular evolution. Cooperation and conflicts in evolutionary biology. Uses and implications of evolutionary sciences

Practicals-32 Hrs

- (1) Study of floral biology of crops - typical examples of self and cross pollinated plants.
- (2) Selfing and hybridization techniques - Bagging and emasculation.
- (3) Pollen viability: germination test and TTC test.
- (4) Studying of centre's of origin of cultivated crops - N.I. Vavilov Concept.
- (5) Mode of pollination study in different crops.
- (6) Identification of crop breeding institutes/ centers and logos.
- (7) Studying and identification of contributors of plant breeding - M.S. Swaminathan, N.I. Vavilov, Norman . E. Borlaug .
- (8) Study of contributions of scientists to evolutionary biology.
- (9)-12) Study of models and photographs related to evolution.

References

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