GONDWANA UNIVERSITY

GADCHIROLI

SEMESTER SYSTEM PATTERN SYLLABUS

for

B.Sc.

BOTANY

SEMESTER- IV

(With effect from: 2013-14)

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B.Sc. BOTANY
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B.Sc.

SEMESTER –IV

Paper – I	: Cell Biology, Genetics and Plant Breeding	50 marks
Paper – II	: Molecular Biology and Biotechnology	50 marks
Practical – II	: Based on Paper – I & II of Semester – IV	30 marks
Internal Assessment	: Based on Assignment/ Seminar & Unit test	20 marks

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SEMESTER – IV

Paper – I

Cell Biology, Genetics and Plant Breeding

UNIT I:

1. Structure of typical plant cell
2. Cell envelop: Ultrastructure and functions of cell wall and plasma membrane
3. Cell organelles: Ultra structure and functions of Nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, vacuoles
4. Microbodies: Lysosomes, peroxysomes, glyoxysomes
5. Cell division: Mitosis, Meiosis with respect to plants.

UNIT II:

6. Mendelism : law of seggregation, law of independent assortment
7. Interaction of genes –with reference to plants
   a) Allelic interaction : incomplete dominance (1:2:1)
   b) Non-allelic interaction : Complementary gene (9:7), supplementary gene (9:3:4),
8. Extra nuclear genome: Presence & functions of Mitochondrial & plastid DNA

UNIT III:

9. Linkage –Definition, Gene theory of Morgan, types of linkage – complete and incomplete, Significance
10. Crossing over: Definition, theories (Breakage and reunion, copy choice), Significance
11. Variation in chromosome number: Polyploidy (auto- and allo-), aneuploidy (nullisomics, monosomics, trisomics and tetrasomics), Significance
12. Structural changes in chromosome: Deletion & deficiency, duplication, inversion and translocation

UNIT IV:

13. Mutation: Spontaneous and induced, substitution and frame-shift mutations, physical and chemical mutagens, application of induced mutations in crop improvement
14. Plant Breeding- Definition and objective, Pure line selection, Hybridization (emasculation, bagging, crossing, labelling), Clonal selection, Heterosis (Definition and scope)

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SEMESTER – IV

Paper – II

Molecular Biology and Biotechnology

UNIT – I : Molecular Biology:

1. DNA: Introduction, DNA as Genetic Material (Experiments of Griffith , Harshey and Chase), Structure of DNA (The Double Helix) , Forms of DNA(A, B & Z).
2. DNA- Protein Interaction (Nucleosome Model, Packaging of DNA) ,
3. RNA : Structure, types and function
4. Replication of DNA

UNIT –II : Molecular Biology:

5. Genetic Code :- Characteristics, Wobble Hypothesis
6. Protein synthesis : Transcription, translation
7. Satellite DNA and Repetitive DNA
8. RNA Processing

UNIT –III : Genetic engineering:

1. Tools and techniques of recombinant DNA technology, cloning vectors (Plasmids, Bacteriophage and Agrobacterium), Restriction enzymes and Ligases
2. Genomic and c-DNA library
3. Gene structure: Structure of prokaryotic and eukaryotic gene, Jumping genes(transposons), e.g. Ac/Ds elements in Maize, Regulation of gene action in Prokaryotes (Lac operon Concept)

UNIT – IV : Tissue culture:

4. History and applications, Basic aspects of plant tissue culture
5. Methods of Sterilisation,
6. Nutrient Medium (MS and White),
7. Types of explants , Cellular Totipotency, Differentiation, Morphogenesis
8. Organogenesis , Somatic Embryogenesis, Artificial Androgenesis, Protoplast Culture, Micropropogation, e.g., Banana, Eucalyptus

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SUGGESTED LABORATORY EXERCISES

Make use of the permanent micro preparations, specimens, transparencies, photographs, temporary mounts, etc.

1. Examination of various stages of mitosis and meiosis using appropriate plant material (i.e. Onion root tips and flower buds respectively)
2. Working out of Laws of inheritance using dry seeds / plastic beads by applying Chi-square ($\chi 2$) test.
3. To get acquainted with the Laboratory organization.
4. To get acquainted with tools of genetic engineering, laboratory equipments, apparatus and instruments in biotechnology laboratory.
5. To study the different methods of sterilization.
6. Media preparation required for culture.
7. To study the structure of following vectors on the basis of photographs and diagrams: Plasmid, Bacteriophage and *Agrobacterium*
8. To demonstrate the technique of micropropogation by using different explants e.g., axillary bud and shoot meristem.
9. To demonstrate the technique of anther culture.
10. To isolate protoplast from different tissues using commercially available enzymes.

NOTE:

1. Frequent Industrial/ Laboratory visits are necessary

2. Submit Industrial/ Laboratory visit report duly signed by HOD.

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Schedule for Practical Examination

Time: 5 Hours Max. Marks: 30

Q 1. Prepare semi-permanent squash/smear of given material and identify the stage.

04 Marks

Q 2. Prove Mendel's laws of inheritance by using coloured plastic beads/ seeds and Apply Chi-square ($\chi 2$) test. 04 Marks

Q 3. Prepare the culture media required in the tissue culture laboratory. 04 Marks

Q 4. Perform an experiment from plant tissues culture.

06 Marks

Q 5. Spotting

[A] Cell Biology (Mitosis/Meiosis)

[B] Genetics/Plant Breeding

[C] Laboratory instruments/equipment

[D] Tissue Culture

[E] Vector Identification 05 Marks

Q 6. Viva-voce 02 Marks

Q 7. Practical Record & Industrial visit Report 05 Marks

TOTAL- 30 Marks

NOTE: Well labelled diagrams are expected wherever necessary