

GOVT. BILASA GIRLS' P.G. (Auto.) COLLEGE

Link Road, Bilaspur (C.G.)

Phone No. : 07752-224249, Website : www.bilasagrillscollege.ac.in



SYLLABUS

M.Sc. Botany
Semester - I & II

2021-22



DEPARTMENT OF BOTANY

**"Regulation for Examination (Semester System)
At Post Graduate Level, Under Autonomous Scheme"
Session : 2021-22**

Bilaspur Universtiy, Bilaspur (C.G.) vide letter No. 277/Bub/Acad/2012dated 12/9/2012 has granted affiliation to the Govt. Girls' P.G. College, Bilaspur (C.G.) Further the University Grants Commission, New Delhi vide letter No. F-22.01.2005 (Desk-AC) December 2005 and Guru Ghasidas University, Bilaspur (C.G.) vide letter No. 81/CDC/Auto/2006 dated 22.05.2006 have extended the autonomous Govt. Girls' P.G. College upto 2011 which has been again extended till the session 2016-17 vide letter No. UGC F-22-1/2011 AC January 2012 and now UGC conferred Autonomy upto 2023. The University has authorized Govt. Girls' P.G. College, Bilaspur (C.G.) to frame syllabus and conduct examination in the following faculties the subjects at the Post Graduate level.

FACULTY

SUBJECT

I. Arts

- | | |
|-------------------|---------------------------|
| 1. M.A. Economics | 2. M.A. English |
| 3. M.A. Geography | 4. M.A. Hindi |
| 5. M.A. History | 6. M.A. Political Science |
| 7. M.A. Sociology | 8. M.A. Urdu. |
| | 9. M.A. Psychology |

II. Science Faculty

1. M.Sc. Botany
2. M.Sc. Chemistry
3. M.Sc. Food & Nutrition
4. M.Sc. Human Deveiopment
5. M.Sc. Mathematics
6. M.Sc. Physics
7. M.Sc. Zoology
8. P.G. Diploma in Computer Science.

III. Commerce

1. M.Com.

IV. BJLib. I.Sc.

1. As per the decision taken by the Co-ordination Committee in its Eleventh meeting, and in compliance of the order issued by the Directorate of Higher Education, vide letter No. 341/187/CHE/Co-ord/06 dated 27.04.2006 Govt. Girls' P.G. College Bilaspur (C.G.) is semester system of examination from the session 2007 at post Graduate Level.
2. The course, of siudy at the post Graduate Level (Master of Science, Master of Arts and Master of Commerce) is extended over four semesters in two academic Sessions. Examination of the first & Second semesters will be held in the first academic session and the third and fourth semesters in the second academic session.
3. Practical Examination of the science Faculty / Subjects will be held with the theory examination in each semester, where as Viva-Voce Examination of Arts and Commerce Faculty will be held with the theory examination of second and fourth semester.

ADMISSION:

4. The admission in the Post Graduate Classes shall be strictly on merit basis in accordance to the admission rules of Govt. of Chhattisgarh State.
5. A graduate from any recognized University of Chhattisgarh State is eligible for admission in the Post Graduate Classes. A graduate from any recognized University outside of the Chhattisgarh state will also be eligible for admission in the Post Graduate Classes provided, she fulfills all other conditions of eligibility.

SYLLABUS:

6. Each course shall be framed and approved by the Board of studies of that subject and Academic Council of the college.
7. There shall be four or five theory papers in each subjects in each semester Practical examination of the subjects shall be conducted as per the syllabus framed and approved by the Board of Studies of that subject.
8. A student who has 60% or more aggregate marks in three semester can opt Dissertation as an Optional Paper in the forth semester if there is such a provision in the course of that subject.
9. In the theory papers of semester examination, there shall be 80 marks for external examination and 20 marks for internal examination. Each theory paper of the semester examination shall be of 80 marks in which there shall be ten questions in total out of which a candidate will have to attempt five questions Maximum marks of the practical decided by the board of studies of the subject.

EXAMINATION PATTERN :-

10. There shall be main examination at the end of the each semester First and Third semester examination shall be held as for a possible in the month of November and second & fourth semester examination shall be held as for as possible in the month of April.
11. To be successful in the exam a student has to score at least 20% marks in each Internal & External theory papers with an aggregate of 36% marks. Also to be successful in each practical paper a student has to score 36 marks. Best marks of the two internal text examination will be incorporated in the marks of semester examination. The head of the department shall submit the detailed mark list to the controller of Examination after the completion of all tests and seminars.
12. 12. A student declared fail in one or two papers in the semester examination can appear in the second attempt examination in the same paper which will be held after two months of the main semester examination but if a student declared failed in more than two papers of the semester examination will have to appear in all the four or five papers in the second attempt examination.
13. If a student is absent in all the papers of the main semester examination then she will be ineligible to appear in the second attempt examination, but if a student appears in some papers and fail to appear in the remaining papers of the main semester examination then she will have to submit an application giving reason to . the principal / Controller with sufficient

proofs. On the basis of proofs a High level committee will decide upon the matter. High level committee will have power to allow the student to appear in the second attempt examination.

14. A student who fails in a semester examination shall be eligible to take admission in the course of study of next semester but she shall not be eligible to appear in the next semester examination unless has passed all the remaining papers of the previous semester in the second attempt examination.
15. The admission of the student who fails in the second attempt examination of a semester, the admission to the next semester will automatically be cancelled and she will have to appear in all the papers of the semester examination in the next academic session as an Ex-student but marks of the internal examination will carry forward.
16. It is a must for the students to appear in the Internal test on the scheduled dates which will be declared by examination cell failing to which she shall be declared fail. If due to some unavoidable circumstances and sufficient reason the students fails to appear in the test on scheduled dates they have to appear before the High level Committee comprising of the Principal, Controller of Exam and Head of the Department of the particular subject with sufficient proof. The high level committee will decide the matter based on the proofs submitted by the students.
17. If a student leaves the college after taking admission in a course of study of semester without appearing in Internal & External examination and if she would like to take admission in any forthcoming academic session in the same semester she shall be given admission in the same session as a regular student but her status will be of Ex-student,
18. For Diploma courses there shall be annual examination pattern in which only external examination and practical examination will be held. There shall be no internal examination and seminars for these courses. Syllabus of these courses shall be framed by the board of studies, of the particular subject.
19. For B.Lib. I.Sc. course there shall be Annual Examination pattern and Internal tests & seminars will be organized.

Marks Scheme/Pattern of Question-

According to decision taken by the academic council of the college the pattern and marks scheme of question paper for P.G. as follows –

Type of Question	Q. to be set From each unit/Content	Q. to be solved	Marks Assigned	Total Marks
Objective / In few words	10	06	02	12
Short Answer Type Questions	07	04	05	20
Long/Essay type of question	07	04	12	48
			TOTAL	80

DIVISION AWARD

20. If a student is absent in all the papers of the main semester examination then she will be ineligible to appear in the second attempt examination, but if a student appears in some papers and fail to appear in the remaining papers of the main semester examination then she will have to submit an application giving reason to the principal / Controller with sufficient proofs. On the basis of proofs a High level committee will decide upon the matter. High level committee will have power to allow the student to appear in the second attempt examination.
21. The division shall be awarded at the end of the Fourth Semester on the basis of taking together the aggregate of marks obtained by the students in all the four semester examination. The division shall be awarded on the following basis –
1. I Division - 60% & above
 2. II Division - 48% & above but less than 60%
 3. III Division - 36% & above but less than 48%
22. A candidate who fails by one mark in a paper or in aggregate, shall be given grace mark but this one mark shall nowhere be added. Such candidate shall be declared pass with grace.
23. A candidate who lacks one mark to attain division shall be given one grace marks.
24. The names of first five candidates who have obtained first division at the end of the fourth Semester will be declared in the order of merit.

REVALUATION :-

25. A candidate can apply for revaluation of answer books in not more than two theory papers: She has to pay prescribed fee for each paper within 15 days after the publication of the result of the semester examination. The provision of revaluation is only for the main exam and there is provision of revaluation for the second attempt examination.
26. The change in the marks will depend upon the rules of revaluation issued by the Bilaspur University, Bilaspur from time to time.
27. The points, which are not covered in the regulation mentioned above shall be governed by the existing rules, regulation and ordinance of Bilaspur University, Bilaspur (C.G.)

M.Sc. BOTANY 2021-2022
SEMESTER – I

Paper	Topic	Marks of Internal Assessment	Seminar Test	Marks of Practical	Marks of Theory
I	Molecular Biology & Cytology	10	10	}100	80
II	Biology and Diversity of Micro-Organisms, Algae and Fungi	10	10		80
III	Taxonomy and Diversity of Angiosperms	10	10	}100	80
IV	Plant Biochemistry & Enzymology	10	10		80

- There will be four papers of 80 marks each in every semester.
- 100 marks have been divided into two parts.

1. First part consists of an external examination of 80 marks.
2. Second part consists of an internal assessment of 20 marks.

The marks of internal assessment are redistributed as follows:

(A). Seminar – 10 marks

There will be only one seminar in each paper consisting of 10 marks each.

(B). Test – 10marks

There will be two test examinations in each papers consisting of 10 marks each. Marks of one best test examination will be considered for annual examination.

There will be two practical examinations of 100 marks in each semester.

SEMESTER - I
PAPER - I
MOLECULAR BIOLOGY, CYTOLOGY

The dynamic cell:- Structural organization of the plant cell, specialized plant cell types, chemical foundation, biochemical energetics.

Cell wall:- Structures and functions, biogenesis and growth.

Plasma membrane:- Structures, models and functions, sites for ATPases ion carrier channels and pumps receptors.

Chloroplast:- Structures, genomic organization, gene expression, RNA editing, nucleo-chloroplastic interactions.

Mitochondria:- Structures, genomic organization and biogenesis.

Nucleus:- Structures, nuclear pores, nucleosome organizations, DNA structural, A, B and Z forms: replication, damage and repair, transcription, plant promoters and transcription, factors, splicing, mRNA transport, nucleolus, r RNA biosynthesis.

Ribosomes:- Structures, site of protein synthesis, mechanism of translation, initiation, elongation and termination, structure and role of t RNA.

Other cellular organelles:- Structures and functions of micro bodies, Golgi apparatus, lysosomes, endoplasmic reticulum and vacuole.

Chromatin Organization:- Chromosomal structure and packaging of DNA, molecular organization of centromere and telomere, nucleolus, karyotype evolution, special types of chromosome: polytene, lampbrush, B-chromosomes and sex chromosomes, molecular basis of chromosomal pairing.

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Suggested Laboratory Exercises:

1. Isolation of mitochondria and the activity of its marker enzyme, succinate dehydrogenase (SDH).
2. Isolation of Chloroplasts and SDS-PAGE profile of proteins to demarcate the two subunits of Rubisco.
3. Isolation of nuclei and identification of histones by SDS-PAGE.
4. Isolation of plant DNA and its qualification by a spectrophotometric method.
5. Isolation of DNA and preparation of cot curve.
6. Restriction digestion of plant DNA, its separation by agarose gel electrophoresis and visualization by Ethidium bromide staining.
7. Isolation of RNA and quantitation by a spectrophotometric method.
8. Isolation of giant chromosomes.
9. Mitosis and meiosis.

Suggested Books:

1. Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
2. Glover, D.M. and Hames, B. D. (Eds), 1995. DNA Cloning 1: A Practical Approach; Core Techniques. 2nd edition. PAS, IRL Press at Oxford University Press, Oxford.
3. Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology. Structure and Function, Jones and Bartlett Publishers, Boston, Massachusetts.
4. Hackett, P.B., Fuchs, J.A. and Messing, J.W. 1988. An Introduction to Recombinant DNA Techniques. Basic Experiment in Gene Manipulation. The Benjamin Cummings Publishing Co., Inc Menlo Park, California.
5. Hall, J.L. and Moore, A.L. 1983. Isolation of Membranes and Organelles from Plant Cells. Academic Press. London UK.
6. P.K. Gupta- Cytology Genetics & Molecular Biology.
7. C.B. Powar- Cell Biology
8. R.C. Dubey & D.K. Maheshwari - Microbiology.

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**SEMESTER – I
PAPER – II**

**BIOLOGY AND DIVERSITY OF
MICRO ORGANISMS, ALGAE AND FUNGI**

- A. **Archaeobacteria and Eubacteria:** General account ultrastructure, nutrition, reproduction and economic importance, Cyanobacteria-salient features and biological importance.
- B. **Viruses:** Characteristics and ultrastructures of virions, isolation and purification of viruses, chemical nature replication, transmission of viruses, economic importance.
- C. **Mycoplasma:** General characteristics and roles in causing plant diseases.

PHYCOLOGY:

Algae in diversified habitats (terrestrial, freshwater and marine) thallus organizations, cell ultrastructure, reproduction (vegetative, asexual and sexual) criteria for classification of algae, pigments, reserve food, flagella, classification, salient features of Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta, algal blooms, algal biofertilizers, algae as food, uses in industry.

MYCOLOGY:

General characters of fungi, substrate relationship in Fungi, Cell Ultrastructure; Unicellular and multicellular organization, Cell wall composition, nutrition (saprobic, biotrophic, symbiotic) reproduction (vegetative, asexual , sexual) heterothallism, heterokaryosis, parasexuality, recent trends in classification, phylogeny of fungi general account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina, Fungi in Industry, as medicines, and food, fungal diseases in plants and humans, Mycorrhizae, Fungi as biocontrol agents.

Suggested Laboratory Exercise:

1. Collection, isolation and identification of Micro-organism.
2. Preparation of culture media and sterilization techniques.
3. Study of Gram Staining of Bacteria.

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4. Morphological study of representative members of algae – Microcystis, Lyngbya, Oscillatoria, Nostoc, Anabina, Rivularia, Gleotrachia, Scytonema, Stigonema, Volvox, Ulothrix, Padiastrum, Hydrodictyon, Ulva, Pithophora, Cladophora, Oedogonium, Bulbochaete, Spirogyra, Zygnema, Coleochaete, Stigeoclonium, Draparnaldia, Draparnaldiopsis, Closterium, Cosmarium, Chara, Caulerpa, Vaucheria, Ectocarpus, Laminaria, Dictyota, Sargassum, Batracospermum, Polysiphonia.
5. Morphological study of representative members of fungi – Stemonitis, Pernospora, Albugo, Mucor, Pilobolus, Saccharomyces, Peziza, Uncinula, Phylactinia, Emericella, Chaetomium, pleospora, Morchella, Puccinia, Melampsora, Polyporas, Drechslera, Phoma, Penicillium, Aspergillus, Cercospora, Alternaria, Colletotrichum.
6. Symptomology of some diseased specimens: White rust, downy mildew, powdery mildew, rusts, smuts, ergot, groundnut leaf spot, red rot of sugarcane, wilts, paddy blast, citrus canker, bacterial blight of paddy, angular leaf spot of cotton, tobacco mosaic, little leaf of brinjal, sesame phyllody, mango malformation
7. Camera Lucida diagrams (Micrometry).

Suggested Books:

1. Alexopoulos, C.J., Mims, C.W. and Blackwel, M. 1996. Introductory Mycology. John Wiley & Sons Inc.
2. Clifton, A. 1958. Introduction to the Bacteria. McGraw-Hill BOOK Co., New York.
3. Kumar, H. D. 1988. Introductory Phycology. Affiliated East-West Press Lid., New Delhi.
4. Mandahar, C.L. 1978. Introduction to Plant Viruses. Chand & Co. Ltd, Delhi.
5. Mehrotra, P. S. and Aneja, R. S. 1998. An Introduction to Mycology. New Age Intermediate Press.
6. Morris, I. 1986. An Introduction to the Algae. Cambridge Univ. Press, U.K.
7. Rangaswamy G. and Mahadevan. A. 1999. Diseases of Crop Plants in India (4th edition) Prentice Hall of India Pvt. Ltd., New Delhi.
8. Round. F. E. 1986. The Biology of Algae. Cambridge University Press. Cambridge.
9. B.R. Vasistha, A. K. Sinha, V. P. Singh – Algae.
10. B.R. Vasistha, A. K. Sinha, V. P. Singh – Fungi.

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**SEMESTER - I
PAPER - III**

TAXONOMY AND DIVERSITY OF ANGIOSPERMS

Origin of Intrapopulation Variation: Population and the environment, ecads and ecotypes, evolution and differentiation of species-various models.

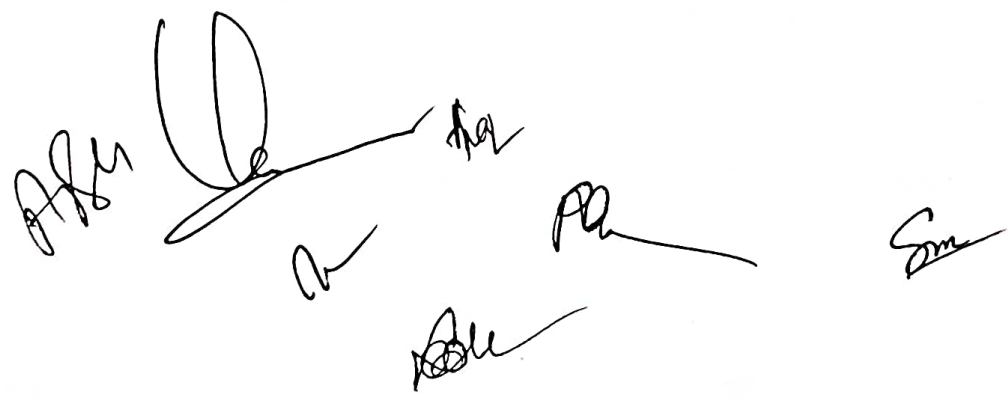
The Species Concept: Taxonomic hierarchy - species, genus, family and other categories, principles used in assessing relationship, delimitation of taxas and attribution of rank.
Salient features of the international code of Botanical nomenclature.

Taxonomic Evidence: Morphology, anatomy, palynology, embryology, cytology, phytochemistry.

Taxonomic tools: Herbarium, floras, histological, cytological, phytochemical, serological, biochemical and molecular techniques.

Systems of angiosperm classification: Phenetic versus phylogenetic systems, cladistics in taxonomy to conservation, sustainable Utilization of bio-resources and ecosystem research.

Concepts of Phytogeography: Endemism, hotspots and hottest hotspots, plant explorations, invasion and introductions, local plant diversity and its socio- economic importance.



Suggested Laboratory Exercises:

Angiosperms

1. Description of a specimen from representative, locally available families.
2. Description of a species based on various specimens to study intra-specific variation: a collective exercise.
3. Description of various species of a genus; location of key characters and preparation of keys at generic level.
4. Location of key characters and use of keys at family level.
5. Field trips within and around the campus, compilation of field notes and preparation of herbarium sheets of such plants, wild or cultivated, as are abundant, through excursion.
6. Training in using floras and herbaria for identification of specimens described in the class.
7. Demonstration of the utility of secondary metabolites in the taxonomy of some appropriate genera.
8. Comparison of different species of a genus and different genera of a family to calculate similarity coefficients and preparation of dendrograms.

Suggested Books:

1. Davis, P.H. and Heywood, V.H. 1973. Principles of Angiosperms Taxonomy. Robert E. Kreiger pub. Co., New York.
2. Grant, W.F. 1984. Plant Biosystematics. Academic Press, London.
3. Harrison, H.J. 1971. New Concepts in Flowering plant Taxonomy. Hieman Educational Books Ltd., London.
4. Heslop-Harrison, J. 1967. Plant Taxonomy. English Language Book Ltd., London.
5. Jones, S.B. Jr. and Luchsinger, A.E. 1986. Plant Systematics (2nd edition). McGraw-Hill Book Co., New York.
6. Nordenstam. B. El Gazaly. G. and Kassas. M. 2000 Plant Systematics for 21st century. Portland Press Ltd., London
7. Radford, A.E. 1986. Fundamentals of Plant Systematics. Harpar & Row Publications, USA.
8. P. C. Vashista – Taxonomy of Angiosperm.
9. Tyagi and Khetrapal- – Taxonomy of Angiosperm.
10. R. C. Mathur— Taxonomy of Angiosperm.
11. D. K. Jain and V. Singh — Taxonomy of Angiosperm.
12. V. N. Naik— Taxonomy of Angiosperm.
13. S.C. Dutta- Systemic Botany.
14. A.B. Randle – Angiosperm.

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SEMESTER - I
PAPER - IV
PLANT BIOCHEMISTRY & ENZYMOLOGY

Membrane transport and translocation of water and solutes: Plant water relations, mechanism of water transport through xylem, root-microbe interaction in facilitating nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport, membrane transport proteins.

Energy Flow: Principles of Thermodynamics, free energy and chemical potential, redox reactions, structure and functions of ATP.

Fundamentals of enzymology: General aspects allosteric mechanism, regulatory and active sites, isozymes, kinetics of enzymatic catalysis, Michaelis-mentan equation and its significance.

Signal transduction: Overview, receptors and G. Proteins, phospholipids signaling, Calcium- calmodulin cascade, diversity in proteins kinesis and phosphates, specific signaling mechanisms.

Phytochorm & regulators : Physiological effects and mechanism of action of auxins gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid and salicylic acid, hormone receptors, gene expression.

Photochemistry and photosynthesis: General Concept and historical background, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, photo oxidation of water, mechanisms of electron and proton transport carbon assimilation – The Calvin cycle, photo respiration and its significance, the C₄ cycle, the CAM pathway, biosynthesis of starch and sucrose, physiological and ecological considerations.

Suggested Laboratory Exercise:

1. Effect of time and enzyme concentration on the rate of reaction of enzyme.
2. Effect of substrate concentration, pH and temperature on activity of enzyme.
3. To determine the plasmolysis of plant tissue.

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4. To determine the diffusion pressure deficit of plant tissue.
5. To determine the rate of transpiration by Darwin's potometer.
6. To observe the antagonistic effect on plant pigments.
7. To demonstration of effect of light intensity, wind velocity and humidity on the rate of transpiration by Genong's potometer.
8. To measure the rate of transpiration by Genong's potometer.
9. To determine the chlorophyll a/ Chlorophyll b ratio in C3 & C4 plant.
10. To separate amino acid mixture by silica gel method (TLC) and calculate 'Rf' values.
11. To separate amino acid mixture by circular disc chromatography techniques.
12. To separate amino acid mixture by descending paper chromatography techniques and calculate 'Rf' values.
13. To determine ion exchange chromatography.

Suggested Books:

1. Buchanan, B.B. Gruissem, W. and Jonco, R.L. 2000, Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, Maryland; USA.
2. Dennis, D.T. Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. (eds) 1997. Plant Metabolism (second edition), Longman, Essex, England.
3. Hopkins, W.G. 1995, Introduction to plant physiology, John Wiley & sons. Inc., New York, USA.
4. J. 2000. Molecular Cell Biology (fourth edition) W.H. Freeman and ompany, New York, USA.
5. Salisbury, F.B. and Rose C.W. 1992. Plant physiology (4th edition). Wadsworth Publishing Co., California, USA.
6. Singhal, G.S. Renger, G., Sopory, S.K. Irrang, K.D. and Govindjee 1999. Concepts in photobiology: Photosynthesis and Photomorphogenesis.
7. Westhoff, P. (1998) Molecular Plant Development: from Gene to Plant. Oxford University Press, Oxford, UK.
8. Verma V. Plant physiology.
9. Malic & Shrivastava Plant physiology.
10. Sarabhai B.P. Plant physiology.

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MEMBERS OF BOARD OF STUDIES
2021-2022

CHAIRMAN:

Dr. Mrs. Snehal Moghe

Smoghe
09.10.2021

FACULTY MEMBERS :

- 1. Dr. Mrs. Asha Kabir
- 2. Dr. D. Meshram
- 3. Dr. Mrs. R.S. Luka
- 4. Dr. Mrs. Usha Singh

Ash
Mesh
R.S. Luka
9.10.21

EXPERT NOMINATED BY:

(i) Academic Council:

- 1. Dr. A.N. Bahadur
Head, Dept. of Botany
Govt. E.R.R. Science P.G.
College, Bilaspur (C.G.)

A.N. Bahadur

- 2. Dr. Mrs. Preeti Tiwari
Principal
Government College,
Beergaon (C.G.)

(ii) Vice Chancellor:

Dr. Veenapani Dubey
Assistant Professor
C.M.D. P. G. College,
Bilaspur (C.G.)

V. Dubey

(iii) Representative from
Industry/Corporate Sector:

Dr. R.K.S.Tiwari
Professor Scientist,
I.G. Agri.University,
Bilaspur (C.G.)

R.K.S. Tiwari

Post Graduate Meritorious
Student from the concerned Subject:

Ku. Aarfeen Khan

Aarfeen Khan

SEMESTER - II
PAPER - I
CYTOLOGY AND GENETICS

Structural & numerical alterations in chromosomes: Origin of meiosis and breeding behaviour of duplication deficiency, inversion and translocation heterozygote; origin occurrence production and meiosis of haploids, aneuploids and euploids; origin and production of autopolyploids. Chromosome and chromatid segregation, allopolyploids, types, evolution of major crop plants, induction and characterization of trisomics and monosomics.

Cell cycle and apoptosis: Mitosis and meiosis cell division, Control mechanism, role of cyclin and cyclin dependent kinases retinoblastoma and E2F proteins cytokinesis and cell plate formation, mechanism of programmed cell death.

Genetics of prokaryotic organelles: Mapping the bacteriophage genome genetic recombination in phage, genetic transformation, conjugation and transduction in bacterium, genetics of mitochondrion and chloroplast, cytoplasmic male sterility.

Gene structure and expression: Genetic fine structures, cis- trans test, fine structures analysis of eukaryotes, introns and their significance, RNA splicing.

Mutations: Spontaneous and induced mutations; physical and chemical mutagens, molecular basis of gene mutations, transposable elements in prokaryotes and eukaryotes, mutations induced by transposons, site directed mutagenesis.

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Suggested Laboratory Exercises:

1. Characteristics and behavior of B chromosomes using Maize.
2. Working out the effect of mono and tri-somy on plant phenotype, fertility and meiotic behavior.
3. Induction of polyploidy using colchicines.
4. Effect of induced and spontaneous polyploidy on plant phenotype, Meiosis, pollen and seed fertility and fruit set.
5. Mitosis and Meiosis.

Suggested Books:

1. Alberts, b. Bray, D. Lewis J., Raff, M. Roberts, K. and Watson. J.D. 1989. Molecular Biology of the cell. 2nd edition. Garland Publishing Inc., New York.
2. Atherly. A.G. Girton, J.R. and McDonald, J.F. 1999. The Science of Genetics. Saunders College Publishing fortworth, USA.
3. Burnham, C.R. 1962. Discussions in Cytogenetics. Burgess Publishing Co., Minnesota.
4. Busch, H. and Rothblum, L. 1982. Volume X. The Cell Nucleus rDNA Part A. Academic Press.
5. Hartl, D.L. and Jones, E.W. 1998. Genetics: Principles and Analysis 4th edition). Jones & Bartlett Publishers. Massachusetts, USA.
6. Khush, G.S. 1973. Cytogenetics of Aneuploids. Academic Press. New York, London.
7. Lewin, B. 2000 Gene VII. Oxford University Press. New York, USA.
8. Lewis, R. 1997. Human Genetics: Concepts and Application 2nd edition).
9. P.K. Gupta-Molecular Biology & Genetics.
10. C.B. Pawar- Genetics part I, II.

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**SEMESTER – II
PAPER – II**

BRYOPHYTA AND PTERIDOPHYTA

Bryophyta: Morphology, Structure, reproduction and life history, distribution, classification, general account of Marchantiales Jungermanniales, Anthocerotales, Sphagnales, Funariales and polytrichales, economic and ecological importance.

Pteridophyta: Morphology, anatomy and reproduction, classification, evolution of stele, heterospory and origin of seed habit, general account of fossil Pteridophyta, introduction to Psilopsida, Lycopsidea, Sphenopsida and Pteropsida.

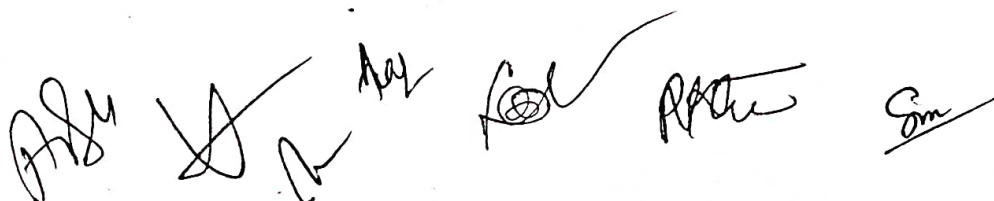
Suggested Laboratory Exercises:

Morphological study of representative members of Bryophytes:- Riccia, Marchantia, Targionia, Plagiochasma, Peltia, Anthoceros, Notothylus, Sphagnum, Polytrichum, and Pteridophytes:- Psilotum, Lycopodium, Selaginella, Equisetum, Gleichenia, Pteris, Marsilia, Azolla, Ophioglossum Isoetes.

Collection & study of morphology, anatomy and reproductive structures of Bryophytes and Pteridophytes through excursion in our locality.

Suggested Books:

1. Parihar N.S. – Bryophyta central book deptt. Allahabad
2. Parihar N.S. – Biology & morphology of Pteridophytes
3. Negi S.S. – Introduction of Science & Recent Studies on Indian Bryophytes.
4. Smith G.M. – Bryophytes & Pteridophytes.
5. Kashyap S.R. – Bryophytes of the Himalayan regions.
6. Sporne K.K. – The morphology of Pteridophytes.
7. Stewart W.N. – Paleobotany and evolution of plants.
8. Vashishta, Sinha & Kumar – Bryophyta.
9. Vashishta, Sinha & Kumar – Pteridophyta.



**SEMESTER – II
PAPER – III**

TAXONOMY AND DIVERSITY OF GYMNOSPERMS

Introduction: Gymnosperms, the vessel-less and fruitless seed plants varying in the structure of their sperms, pollen grains germination, and the complexity of their female gametophyte, evolution of gymnosperms.

Classification of Gymnosperms and their distribution in India.

Brief account of the families of Pteridospermales: (Lyginopteridaceae, Medullosaceae, Caytoniaceae, and Glossopteridaceae)

General account of Cycadeoidales and Cordaitales.

Structure & reproduction: Cycadales, Ginkgoales Coniferales, Ephedrales, Welwitschiales, and Gnetales.

Suggested Laboratory Exercises:

1. Comparative study of the anatomy of vegetative and reproductive parts of Cycas, Ginkgo, Cedrus, Abies, Picea, Cupressus, Araucaria, Cryptomeria, Taxodium, Podocarpus, Agathis, Taxus, Ephedra and Gnetum.
2. Study of important fossil gymnosperms from prepared slides and specimens.

Suggested Books:

1. Chamberlain, C.J., Kochar, P. C., Vashishta, P.C. – Gymnosperm
2. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International. Pvt. Ltd., New Delhi
3. Cole, A.J. 1969. Numerical Taxonomy, Academic Press, London.
3. Kar & Ganguli – College Botany.
4. Singh, H. 1978. Embryology of Gymnosperms. Encyclopadeia of Plant Anatomy X. Gebruder Bortrager, Berlin.
5. Solbrig, O.T. And Solbrig, D.J. 1979. Population Biology and Evolution Addison. Wesley Publishing Co. Inc., USA.
6. Stebbins, G.L. 1974. Flowering Plant – Evolution Above species level. Edward Arnolds Ltd., London.
7. Vashishta, Sinha & Kumar – Gymnosperm.
8. Sporne K.K. – Gymnosperm.

SEMESTER – II
PAPER - IV

PLANT PHYSIOLOGY & METABOLISM

Respiration: Overview of plant respiration, glycolysis, TCA cycle, electron transport and ATP synthesis pentose-phosphate pathway, glyoxylate cycle, alternative oxidase system.

Lipid metabolism: structure and function of Lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids and storage lipids and their catabolism.

Nitrogen fixation & metabolism: Overview biological nitrogen fixation, nodule formation and nodofactors, mechanism of nitrate uptake and reduction, ammonium assimilation.

Transpiration: Overview mechanism and its significance factor affecting transpiration.

Sensory photobiology: History of discovery of phytochromes and cryptochromes their photochemical and biochemical properties, photophysiology of light-induced responses, cellular localization, molecular mechanism of action of photomorphogenics.

Flowering Process: Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development – genetic and molecular analysis, role of vernalization.

Stress Physiology: Plant responses to biotic and abiotic stress, mechanisms of biotic and abiotic stress tolerance, HR and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.

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Suggested Laboratory Exercise:

1. To determine the RQ of the different respiratory substrate.
2. Demonstration of Avena Strength growth test for the activity of growth hormones (Auxin)
3. Demonstration of Avena root inhibition test for the activity of IAA.
4. Experiment to measure growth in Plants by arc auxanometer.
5. Experiment to show phototropism in plants.
6. Extraction of seed proteins depending upon the solubility.
7. Preparation of the standard curve of protein and estimation of the protein content in extras of plant material by lowry's or Bradford's method.
8. Radioisotope methodology, autoradiography, instrumentation (GM counter and Scintillation counter) and principles involved.
9. Principle of Colorimetry, spectrophotometry and fluorimetry.
10. To separate chlorophyll pigments by paper chromatography techniques.
11. To separate Anthocyanin pigments by paper chromatography techniques.
12. To separate amino acid mixture by ascending paper Chromatography techniques and calculate Rf value.

Suggested Books:

1. Dennid, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. (eds) 1997. Plant Metabolism (second edition). Longman, Essex, England.
2. Hopkins, W.G. 1995. Introduction to plant Physiology, John Wiley and Sons, Inc., New York, USA.
3. Moore, T.C. 1989. Biochemistry and physiology of Plant Hormones (second edition). Springer-verlag, New York, USA.
4. Nobel, P.S. 1999. Physiochemical and Environmental Plant Physiology (second edition). Academic Press, San Diego, USA.
5. Shrivastava H.L. Plant physiology & Metabolism.
6. Street H.S. Plant Physiology.
7. Bidwell R.G.S. Plant Physiology.
8. Verma S.K. Plant Physiology.
9. Kochar P.L. Plant Physiology.

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17

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Bilaspur (C.G.)

RKS

Post Graduate Meritorious
Student from the concerned Subject:

Ku. Aarfeen Khan

M.Sc. BOTANY 2021-2022
SEMESTER – III

Paper	Topic	Marks of Internal Assessment	Seminar Test	Marks of Practical	Marks of Theory
I	Plant Development & Growth	10	10	}100	80
II	Plant Ecology	10	10		80
III	Biotechnology & Tissue Culture	10	10	}100	80
IV	Plant Pathology & Physiology of Parasitism	10	10		80

Note: There will be four theory papers of 80 marks in each semester. 100 marks have been divided into two parts.

- (1). First part consists of an external examination of 80 marks.
- (2). Second part consists of an internal assessment of 20 marks.

The marks of internal assessment are redistributed as follows:

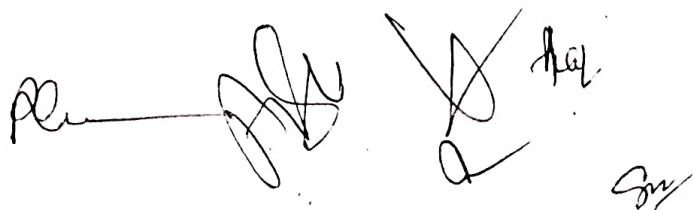
(A). Seminar – 10 marks.

There will be only one seminar in each paper consisting of 10 marks each.

(B). Test – 10 marks.

There will be two test examinations in each paper consisting of 10 marks each.

Marks of one best test examination will be considered for annual examination.



SEMESTER – III**PAPER – I****PLANT DEVELOPMENT AND GROWTH**

Introduction:- Unique features of plant development differences between animal and plant cell.

Seed germination and seedling growth:- Metabolism of nucleic acid, proteins and mobilization of food reserves; tropisms; hormonal control of seedling growth; gene expression, use of mutants in understanding seedling development.

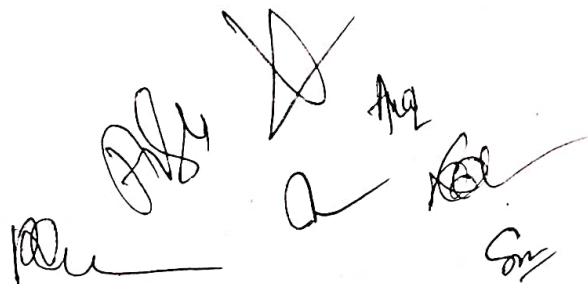
Latent life:- Dormancy:- Importance and types of dormancy; seed dormancy; overcoming seed dormancy; bud dormancy.

Root development:- Organization of root apical meristem (RAM); cell fates and lineages; vascular tissue differentiation; lateral roots; root hairs; root microbe interactions.

Shoot development:- Organization of the shoot apical meristem (SAM); Cytological and molecular analysis of SAM; Control of tissue differentiation, especially xylem and Phloem, secretory ducts and laticifers wood development in relation to environmental factors.

Leaf growth and differentiation:- Determination; phyllotaxy; control of leaf form; differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll.

Senescence and programmed cell death (PCD):- Basic concepts, types of cell death, PCD in the life cycle of plants, metabolic changes associated with senescence and its regulation influence of hormones and environmental factors on senescence.

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Suggested laboratory Exercises:

1. Effect of gravity, unilateral light & plant growth regulators on the growth of young seedlings.
2. Role of dark and red light/far-red on the expansion of cotyledons and epicotylar hook opening in pea.
3. Study of living shoot apices by dissections using aquatic plants such as *Ceratophyllum* and *Hydrilla*.
4. Study of cytohistological zonation in the shoot apical meristem (SAM) in sectioned and double stained permanent slides of a suitable plants such as *Coleus*, *Kalanchoe*, *Tobacco*. Examination of shoot apices in a monocotyledon in both T.S. and L.S. to show the origin and arrangement of leaf primordia.
5. Study of whole roots in monocots and dicots. Examination of L.S. of root from a permanent preparation to understand the organization of root apical meristem and its derivatives. (Use maize, aerial roots of banyan, *Pistia*, *Jussiaea* etc.). Origin of lateral roots. Study of leguminous roots with different types of nodules.

Suggested Books:

1. Atwell, B.J., Kriedermann, P.E. and Turnbull, C.G.N. (eds) 1999. *Plants in Action; Adaptation in Nature, Performance in Cultivation*. Macmillan education, Sydney, Australia.
2. Bewley, J.D & Black, M. 1994. *seeds: physiology of development & germination*. Plenum press, New York.
3. Burgess, J. 1985. *An introduction to plant development*, Cambridge university press, Cambridge.
4. Fahn, A 1982. *plant anatomy* (3rd edition) Pergamon press, Oxford.
5. Howell S.H 1998 *Molecular genetics of plant development*. Cambridge university press, Cambridge.
6. Lynden, R.F. 1990. *The plant development. The cellular basis*. Unwin Hyman. London.
7. Vashista P.C. *Plant anatomy*.
8. Eams & MacDaniels *Anatomy of plants*.
9. Pandey B.P. *Anatomy*.
10. Tayal & Tayal *Plant Anatomy*.

PLA a BC SM

**SEMESTER – III
PAPER – II
PLANT – ECOLOGY**

Climate, soil and vegetation patterns of the world :- Major biomes and major vegetation and soil types of the world.

Vegetation Organization :- Concepts of community and continuum, analysis of communities (analytical and synthetic characters), Community coefficients, inter specific association, concepts of ecological niche.

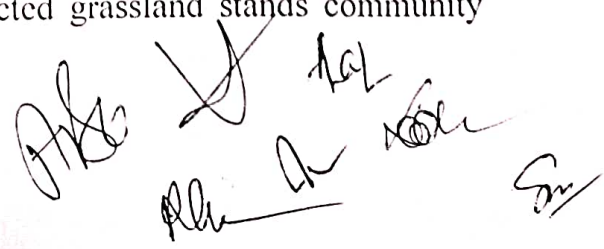
Ecosystem Organization :- Structure and functions; primary production (methods of measurement, global pattern, controlling factors), energy dynamics (tropic organization, energy flow pathway, ecological efficiencies), litter fall and decomposition (mechanism, substrate quality and climate factors); global biogeochemical cycles (pathways, processes budgets) in terrestrial and aquatic ecosystems.

Climate Change :- Greenhouse Gases (CO₂, CH₄ CFCS; sources, trends and role); Ozone layer (CO₂ concentration, global warming, sea level rise, UV radiation).

Green Revolution:-Benefits and adverse consequences.

Suggested Laboratory Exercises:

1. To calculate mean variance, standard derivation, standard error, coefficient of variation and to use t-test for comparing two means related to ecological data.
2. To prepare ombrothermic diagram for different sites on the basis of given data set and to comment on climate.
3. To find out the relationship between two ecological variable using correlation and regression analysis.
4. To determine minimum size and number of quadrants required for reliable estimate of biomass in grasslands.
5. To find out association between important grassland species using Chi-square test.
6. To compare protected and unprotected grassland stands community coefficients (similarity indices).



7. To determine diversity indices (Shannon-Wiener, concentration of dominance, species richness, equitability and B-diversity) for protected and unprotected grassland stands.
8. To estimate IVI of species in a woodland using point centred quarter method.
9. To determine gross and net phytoplankton productivity by light and dark bottle method.
10. To determine soil moisture content, porosity and bulk density of soil collected from varying depths at different locations.
11. To study leaf area and leaf area index of a species in a grassland or forest vegetation.
12. Study of ecological adaptation of different plant species.

Suggested Books:

1. Odum E.P. - Fundamentals of Ecology.
2. Odum E.P. - Basic Ecology.
3. Mason C.F. - Biology of fresh water pollution.
4. Brady N.C. - The nature and properties of soil.
5. Heywood V.H. and Watson R.T. - Global Bio - Diversity.
6. Ambast - Principles of Ecology.
7. Mishra R. - Concepts of Ecology.
8. Sharma P.D.- Environmental Ecology
9. Mullar, Dembois D. and Ellenberg H. - Aims and method of negtation ecology.
10. Macanjgee and Bill Virdee - Ecology.
11. Shukla and Chandel- Plant Ecology.
12. K.N. Bhatia - Plant Ecology.

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SEMESTER – III
PAPER – III
BIOTECHNOLOGY AND TISSUE CULTURE

Biotechnology: Basic concepts, principles and scope.

Plant cell and tissue culture: General introduction, history, scope, concepts of cellular differentiation, totipotency.

Organogenesis and adventive embryogenesis: Fundamental aspects of morphogenesis, somatic embryogenesis and androgenesis, mechanisms, techniques and utility.

Somatic Hybridization: Protoplast isolation, fusion and culture, hybrid selection and regeneration, possibilities, achievements and limitations of protoplasts research.

Applications of plant tissue culture: Clonal propagation, artificial seed; production of hybrids and somaclones, production of secondary metabolites/natural products, cryopreservation and germplasm storage.

Suggested Laboratory Exercise:

1. To study different types of culture and their preparation method.
2. Preparation of nutrient culture medium.
3. To prepare a culture of E. coli in nutrient broth-medium.
4. Isolation of Rhizobia from root nodules of Lathyrus sativa.
5. Root clearing to show VAM colonization.
6. Study of leaf surface microbe by leaf clearing method.
7. Study of leaf surface by cello tape method.
8. Study of leaf surface by leaf washing method.
9. Separation of amino acid from a mixture by paper chromatography.
10. Fertility test of pollen grain by staining method.
11. Fertility test of pollen grain by germination of pollen grain.
12. Fertility test of pollen grain by germination of pollen grain.
13. Growth characteristics of E. coli using of planting and turbidimetric methods.
14. Isolation of plasmid from E. coli by alkaline lysis method and its quantitation spectrophotometrically.

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- 15. Isolation of protoplasts from various plant tissues and testing their viability.
- 16. Effect of physical (e.g. temperature) and chemical (e.g. osmoticum) factors on protoplast yield.
- 17. Demonstration of protoplast fusion employing PEG.
- 18. Culture of E. coli in nutrient broth medium.
- 19. Culture E. coli on solid nutrient agar media.

Suggested Books:

- 1. Bhojwani, S.S. and Razdan, M.K. 1996. Plant Tissue Culture: Theory and Practice (a revised edition). Elsevier Science Publishers, New York, USA.
- 2. Bhojwani, S.S. 1990. Plant Tissue Culture: Application and Limitations. Elsevier Science Publishers, New York, USA.
- 3. Glazer, A.N. and Nikaido, H. 1995. Microbial Biotechnology. W.H. Freeman & Company, New York, USA.
- 4. Henry, R.J. 1997. Practical Application of Plant Molecular Biology. Chapman & Hall, London, UK.
- 5. Shantharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety, and Biodiversity. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- 6. De Kalyan Kumar – Plant tissue culture.
- 7. Ramawat K. G. Plant Biotechnology.
- 8. Gupta P.K. – Elements of Biotechnology.
- 9. Dubey R. C. – A Text Book of Biotechnology.
- 10. Purohit S.S. - Plant tissue culture.
- 11. Kumarsan V. - Biotechnology.

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**SEMESTER – III
PAPER – IV
(SPECIAL PAPER)**

PLANT PATHOLOGY – PHYSIOLOGY OF PARASITISM

General characteristic of fungi, bacteria and viruses: their heterotrophic behavior with emphasis on parasitism parasitic ability and virulence.

Symptomatology: General symptoms of plant disease varieties, pathogenic and nonpathogenic diseases.

Pathogenicity: Distribution of plant pathogens, mode of infection, Inoculum and Inoculum potential, Koch's postulate.

Pathogens attack and defense mechanisms: Physical, Physiological, biochemical and molecular aspects, resistance and susceptibility, phytotoxic effect, disease and syndrome.

Suggested Practicals:

1. Collection of materials from different sources.
2. Preparation of different types of culture media.
3. Isolation, Inoculation and identification of pathogens.
4. Koch's Postulation.
5. Camera Lucida diagrams (micrometry)

Suggested Books:

1. Plant Pathology - R.S. Singh
- G.N. Agrios
- Bilgrami & Dubey
- B.P. Pandey
2. Disease of Crop plants- Rangaswami & Mahadevan

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Bilaspur (C.G.)

Post Graduate Meritorious
Student from the concerned Subject:

Ku. Aarfeen Khan

SEMESTER – IV
PAPER – I
EMBRYOLOGY & PLANT RESOURCES

Male gametophyte: Structure of anthers microsporogenesis, role of tapetum pollen development and gene expression; male sterility; sperm dimorphism and hybrid seed production; pollen germination, pollen tube growth and guidance; pollen storage; pollen allergy.

Female gametophyte: Ovule development; megasporogenesis; organization and structure of the embryo sac.

Pollen-pistil interaction and fertilization: Structure of pistil; pollen-stigma interaction; sporophytic and gametophytic self-incompatibility (Cytological, biochemical and molecular aspects); double fertilization; in- vitro fertilization.

Seed development and fruit growth: Endosperm development during early, maturation and desiccation stages, embryogenesis, poly-embryony, apomixis, embryo culture, fruit growth and maturation.

Plant resources with special reference to Chhattisgarh:

(A) Origin, evolution, botanical cultivation and uses of:

- (i) Food, forage and fodder crops.
- (ii) Fiber crops.
- (iii) Medicinal and aromatic plants.
- (iv) Vegetable oil- yielding crops.

(B) Important firewood and timber yielding plants and non-wood forest products (NWFPs): such as bamboo's rattans, raw materials for paper-making, gums, tannins, dyes, resins.

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Suggested Laboratory Exercises:

1. Microscopic examination of vertical sections of leaves such as Cannabis, Tobacco, Nerium, Maize and Wheat to understand the internal structure of leaf tissues and trichomes, glands etc. Study the C3 and C4 leaf anatomy of plants.
2. Study of epidermal peels of leaves such as Coccinia, Gaillardia, Tradescantia, Notonea, etc. to study the development and final structure of stomata and prepare stomatal index. Demonstration of the effect of ABA on stomatal closure.
3. Study of microsporogenesis and gametogenesis in sections of anthers.
4. Examination of modes of anther dehiscence and collection of pollen grains for microscopic examination (Maize, Grasses, Cannabis, Sativa, Croton, Tradescantia, Brassica, Petunia, Solanum Melongena, etc)
5. Study of ovules by slide preparations; study of monosporic, bisporic and tetrasporic types of embryo sac development through examination of permanent stained serial sections.
6. Isolation of zygotic globular endosperm through sections and staining.

Suggested Books:

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
2. Fageri, K. and Van der piji, L. 1979. The principles of Pollination Ecology. Pergamon Press, Oxford.
3. Howell, S.H. 1998. Molecular Genetics of Plant Development. Cambridge University Press, Cambridge.
4. Raghavan, V. 1997. Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
5. Raghavan, V. 1999. Development Biology of Flowering Plants. Springer-Verlag, New York.
6. Shivanna, K.R. and Sawhney, V.K. (eds) 1997. Pollen Biotechnology for Crop Production and Improvmen. Cambridge University Press, Cambridge.
7. Shivanna, K.R. and Rangaswamy, N.S. 1992. Pollen Biology: A Laboratory Manual. Springer-Verlag, Berlin.
8. Shivanna, K.R. and Johri, B.M. 1985. The Angiosperm Pollen: Structure and Function. Wiley Eastern Ltd., New York.

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**SEMESTER – IV
PAPER – II**

POLLUTION & CONSERVATION OF PLANTS

Biological diversity: Concepts and levels; role of biodiversity in ecosystem functions and stability; speciation and extinctions; IUCN categories of threat; distribution and global patterns; terrestrial biodiversity; hot spots; inventory.

Principles of conservation: Extinction's environmental status of plants based on international union for conservation of nature.

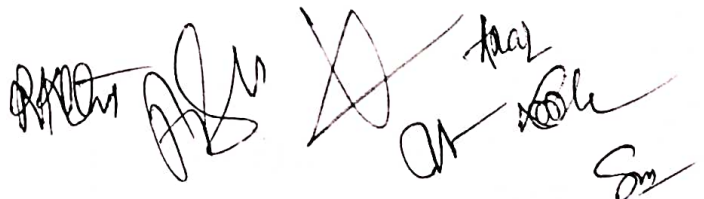
Strategies for conservation: -in situ conservation: International efforts and Indian initiatives; protected areas in India, sanctuaries, national parks biosphere reserves, wetlands, mangroves.

Strategies for conservation: -ex situ conservation: Principles and practices, botanical gardens, gene bank, seed bank, in vitro repositories, cryobanks.

Air, water and soil pollution: Kinds sources quality parameters, effects on plants and ecosystems.

Suggested Laboratory Exercises:

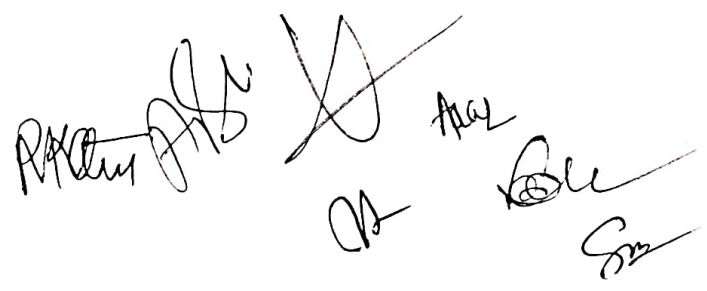
1. To analysis plant communities using Bra-Curtis ordination method.
2. To determine the water holding capacity of soils collected from different locations.
3. To determine percent organic carbon and organic matter in the soils of cropland, grassland and forest.
4. To estimate the dissolved oxygen content in eutropic and oligotropic water samples by azide modifications of Winker's method.
5. To estimate chlorophyll content in SO₂ fumigated plant leaves.
6. To estimate rate of carbon dioxide evolution from different soils using soda lime or alkali absorption method.
7. To study environmental impact of a given development activity using checklist as a EIA method.
8. To determine diversity indices (Shannon-Wiener, concentration of dominance, specie richness, equitably and B-diversity) for protected and unprotected grassland stands.

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- 9. To estimate IVI of the species in a woodland using point centred quarter method.
- 10. To determine the percent leaf area injury of different samples collected around polluted sites.
- 11. To estimate dust holding capacity of different plant species .
- 12. Biochemical analysis of soil sample.

Suggested Books:

- 1. Smith, R.L. 1996. Ecology and Field Biology. Harper Collins, New York.
- 2. Ludwig, J. and Reynolds, J.F. 1988. Statistical Ecology. John Wiley & Sons.
- 3. Odum, E.P. 1971. Fundamentals of Ecology. Saunders, Philadelphia.
- 4. Odum, E.P. 1983. Basic Ecology. Saunders, Philadelphia,
- 5. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. Benjamin/Cummings Publication Company, California.
- 6. Heywood, V.H. and Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
- 7. Hill, M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.


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SEMESTER – IV
PAPER – III
BIOTECHNOLOGY – GENETIC ENGINEERING

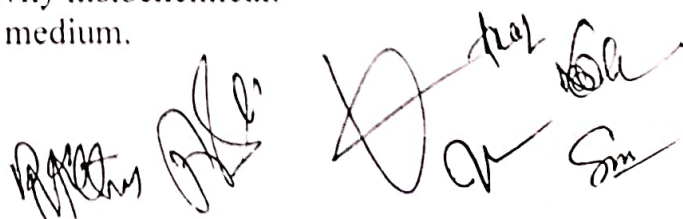
Recombinant D.N.A. technology: Gene cloning, principles and techniques, construction of genomic D.N.A. libraries, choice of vectors, D.N.A. synthesis and sequencing, polymerase chain reaction, D.N.A. finger printing.

Genetic Engineering of plants: Aims strategies for development of transgenic [with suitable example], Agrobacterium – the natural genetic engineer, T-D.N.A. and transposon mediated gene tagging, chloroplast transformation and its utility, intellectual property right, possible ecological risks and ethical concerns.

Microbial genetic manipulation: Bacterial transformation, selection of recombinants and transformants;/genetic improvement of industrial microbes and nitrogen fixers, fermentation technology.

Suggested Laboratory Exercises:

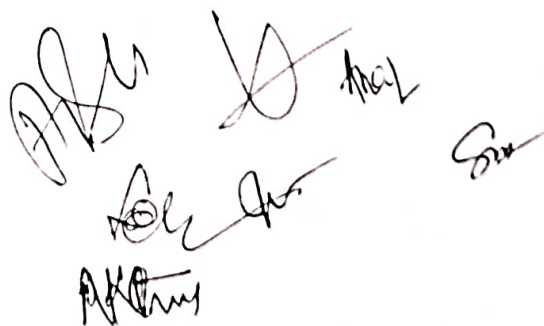
1. Determination of growth characteristics of E.coli in spectrophotometric method.
2. Isolation of VAM fungi and their identification.
3. Study the soil micro-flora by direct method.
4. Study the soil fungi by indirect method.
5. To estimate the soil chlorophyll.
6. To study soil micro-flora by soil dilution method.
7. Restriction digestion of the plasmid and estimation of the size of various DNA fragments.
8. Cloning of a DNA fragment in a plasmid vector, transformation of the given bacterial population and selection of recombinants.
9. Demonstration of DNA sequencing by Sanger's dideoxy method.
10. Organogenesis and somatic embryogenesis using appropriate explants and preparation of artificial seed.
11. Demonstration of androgenesis in Datura.
12. Electroporation of protoplasts and checking of transient expression of reporter gene.
13. Co-cultivation of the plant material (e.g. Leaf discs) with Agrobacterium and study GUS activity histochemical.
14. Culture of E. coli in nutrient broth medium.



15. Culture of *E. coli* on solid nutrient agar medium.
16. Separation of amino acid from a mixture by thin layer chromatography.
17. Separation of amino acid from a mixture by circular disc chromatography

Suggested Books:

1. Brown, T. A. 1999. Genomes. John Wiley & Sons (Asia) Pvt. Ltd, Singapore.
2. Callow, J. A. Ford- Lloyd, B. V. and Newbury, H. J. 1997. Biotechnology and Plant Genetic Resources: Conservation and Use. CAB International, Oxon, U. K.
3. Chrispeels, M. J. and Sadava, D.E. 1994. Plants, Genes and Agriculture. Jones & Barnett Publishers, Boston, USA.
4. Glazer, A.N. and Nikaido, H. 1995. Microbial Biotechnology. W.H. Freeman & Company, New York, USA.
5. Henry, R.J. 1997. Practical Applications of Plant Molecular Biology. Chapman & Hall, London, UK.
6. Jolles, O. and Jornvall, H. (eds) 2000. Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
7. Kartha, K.K. 1985. Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, Florida, USA.
8. Old, R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford, UK.
9. Shantharun, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety, and Biodiversity. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
10. S. N Jogdand- Gene Technology.
11. Arora & Sandhu- Genetics.
12. U. Satyanarayana- Biotechnology.
13. P.K. Gupta- Biotechnology and Genome.



SEMESTER – IV
PAPER – IV
PATHOLOGY – DISEASES OF CROP PLANTS

Effect of environment on disease: Predisposition and stress epidemiology and disease forecasting, sources of infection i.e. seed, soil, water and air born diseases of plant, significance of phyllosphere and rhizosphere.

Control of plant disease: Principle of plant disease control, method of control e.g. regulatory, chemical, biological and breeding of resistant varieties of host plants, plant quarantine, bio pesticides.

Details of diseases: Recommended control for the important disease caused by fungi, bacteria, viruses, mycoplasma or nematodes in the following crop plants.

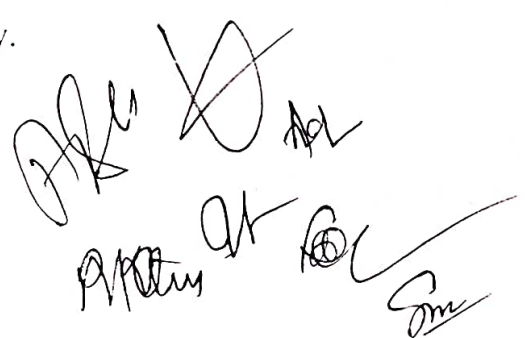
1. Wheat, Rice, Maize, Sugarcane and Bajra.
2. Arhar, gram and pea.
1. Ground nut, Till, Linseed and Cotton.
2. Chilies, Tomato, Potato, Brinjal and Coriander.
3. Citrus, Papaya and Banana.

Suggested Practicals for Pathology:

1. Study of host-Parasite relationship of different crop plants.
2. Study of phyllosphere and Rhizosphere.
3. Study of sources of infection i.e. seed, soil, air and water born.
4. Diseases of crop plants.

Suggested Books:

1. Rangaswami G.- Disease of crop plants.
2. Dubey H.C. –Plant Pathology.
3. Singh R.S. – Plant Pathology.
4. Ali S.S. & Kulshreshtha Preeti-Plant Pathology.



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