

JAMSHEDPUR WOMEN'S COLLEGE
DEPARTMENT OF BOTANY
KOLHAN UNIVERSITY, CHAIBASA



M. Sc. BOTANY

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS

DEPARTMENT OF BOTANY

M. Sc. Botany (Semester Wise Distribution of Courses)

Semester – I

Course Code	Name Of Paper	Full Marks	End Semester Examination	Internal Assessment	Credit
Compulsory Paper	Computer Science	100	70	30	06
(Theory) Core Course I	Microbiology	100	70	30	06
(Theory) Core Course II	Cryptogams	100	70	30	06
Practical III	Practical Based on Paper I and Paper II	100	100		06

Semester – II

Course Code	Name Of Paper	Full Marks	End Semester Examination	Internal Assessment	Credit
Compulsory Paper	Research Methodology	100	70	30	06
(Theory) Core Course IV	Gymnosperm & Taxonomy	100	70	30	06
(Theory) Core Course V	Embryology, Anatomy & Economic Botany	100	70	30	06
Practical VI	Practical based on Paper IV and Paper V	100	100		06

Semester III

Course Code	Name Of Paper	Full Marks	End Semester Examination	Internal Assessment	Credit
(Theory) Core Course VII	Plant Physiology, Biochemistry	100	70	30	06
(Theory) Core Course VIII	Cell & Molecular Biology	100	70	30	06
(Theory) Core Course IX	Genetic Engineering and Biotechnology	100	70	30	06
Practical X	Practical based on Theory	100	100		06

Semester IV

Course Code	Name Of Paper	Full Marks	End Semester Examination	Internal Assessment	Credit
(Theory) Core Course XI	Plant Ecology	100	70	30	06
Special Paper XII	Plant Pathology	100	70	30	06
Practical XIII	Practical based on theory	100	100		06
Paper XIV	Dissertation	100	100		06

COMPULSORY PAPER

Computer Science

UNIT I

Evolution of Computers - Generations, Types of computers, Computer system characteristics, Basic components of a Digital Computer - Control unit, ALU, Input/output functions and memory, Memory addressing capability of a CPU, Word length of a computer, processing speed of a computer, Computer Classification.

UNIT II

Input/output Units-: Keyboard, Mouse, Trackball, Joystick, Digitizing tablet:, Scanners, Digital Camera, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light pen, Touch Screen, Monitors and types of monitor -Digital, Analog, Size, Resolution, Refresh Rate, Dot Pitch, Video Standard - VGA, SVGA, XGA etc., Printers & types - Daisy wheel, Dot Matrix, Inkjet, Laser, Line Printer, Plotter, Sound Card and Speakers.

UNIT III

Memory - RAM, ROM, EPROM, PROM and other types of memory, Storage fundamentals - Primary Vs. Secondary Data Storage, Various Storage Devices - Magnetic tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks (Winchester Disk), Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive, flash drives Video Disk, Blue Ray Disc, SD/MMC Memory cards, Physical structure of floppy & hard disk, drive naming conventions in PC. DVD. DVD-RW, USB Pen drive.

UNIT IV

Software and its Need, Types of Software - System software, Application software, System Software -Operating System, Utility Program, Algorithms , Flow Charts - Symbols, Rules for making Flow chart, Programming languages, Assemblers, Compilers and Interpreter, Computer Applications in Business.

UNIT V

Introduction to Internet, Connecting to the Internet Hardware , Software & ISPs, Search Engines, Web Portals, Online Shopping, Email —Types of email, Compose and send a message. Reply to a message, working with emails.

SEMESTER I
CORE COURSE I
MICROBIOLOGY

Full Marks: 70

Credits: 6

Time: 03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

1. Introduction: A brief idea of microbial diversity; present status and future challenges; a general account of Archaea, Eubacteria and Cyanobacteria
2. Nutritional types of microorganisms, Rhizobium-legume symbiosis and mycorrhiza
3. Anoxygenic photosynthesis with special reference to light reaction in purple bacteria; methanogens
4. Structure and Genetics of bacteria: Genetic recombination- an overview; mechanisms of transformation, conjugation and transduction in bacteria; role of microorganisms in genetic engineering
5. Lytic cycle in T even phages and its regulation; lysogeny and its regulation in lambda phage; a brief account of viroids and prions
6. Water-borne pathogenic microbes; role of microbes in wastewater treatment with special reference to activated sludge
7. Modes of transmission of viruses in plants
8. Economic importance of viruses
9. A general account of Mycoplasma and study of plant diseases:
Grassy shoot of sugarcane, Sesamum phylloidi, Little leaf of Brinjal

SEMESTER I

Core Course II

CRYPTOGAMS

Full Marks: 70

Credits: 6

Time: 03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

ALGAE (PHYCOLOGY)

1. Salient features of classification of Algae (Fritsch, 1935)
2. Range of thallus structure and Reproduction in Algae
3. General Concept of life cycles pattern in Algae.
4. Economic importance of Algae with respect to:
 - a. Algal bloom & algal fertilizers.
 - b. Algae as environmental indicator (Water pollution).
 - c. Algal Biotechnology.
 - d. Diatom and Dinoflagellates.
 - e. Parasitic and Terrestrial Algae.

FUNGI (MYCOLOGY)

1. Salient features and classification of fungi(Aloxopolus)
2. Origin, Evolution and Reproduction of Fungi.
3. Heterothallism and parasexuality.
4. Mycorrhiza: Ectomycorrhiza, Endomycorrhiza& their significance
5. Economic importance of Fungi (role in Agriculture and Forestry)

BRYOPHYTES

1. General features, origin and classification of Bryophytes (Smith, 1955Parihar, 1965.)

2. Range of thallus structure in Bryophytes.
3. Distribution of photosynthetic tissues in Bryophytes.
4. Evolutionary trend of progressive sterilization of sporogenous tissues
5. Ecology and economic importance of Bryophytes with special mention of *Sphagnum*

PTERIDOPHYTES

1. Classification of Pteridophytes (Smith, 1955, Sporne 1975)
2. Heterospory and seed habit.
3. Stellar organization and Evolution of Stele in Pteridophytes.
4. Telome theory: merits and demerits.
5. Pteridophytes of Jharkhand.

SEMESTER I
PRACTICAL III

TIME: 6 Hrs

F.M.: 100

Practical based on theory

SEMESTER II
Compulsory Paper (Research Methodology)

Introduction to Research: Meaning, Characteristics, Objectives and Importance of research, Motivation and objectives – Research methods vs. Methodology. Types and Methods of research: Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, and Conceptual vs. Empirical.

Research Formulation: Defining and formulating the research problem – Selecting the problem – Necessity of defining the problem – Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs – patents – web as a source – searching the web – Critical literature review – Identifying gap areas from literature review – Development of working hypothesis.

Research design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

Data Collection and analysis: Execution of the research – Observation and Collection of data – Methods of data collection – Sampling Methods- Data Processing and Analysis strategies – Data Analysis with Statistical Packages – Hypothesis-testing – Generalization and Interpretation.

Research Report: Types of research reports – Brief reports and Detailed reports; Report writing: Structure of the research report- Preliminary section, Main report, Interpretations of Results and Suggested Recommendations; Report writing: Formulation rules for writing the report: Guidelines for presenting tabular data, Guidelines for visual Representations, Illustrations and tables – Bibliography, referencing and footnotes.

SEMESTER - II

Core Course IV

GYMNOSPERMS& TAXONOMY

Full Marks:70

Credits: 6

Time:03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

GYMNOSPERMS

1. Outline Classification of Gymnosperms and their distribution in India
2. Fossil Gymnosperms – *Lyginopteris*, *Glossopteris*, *Williamsonia*, *Pentoxylon*
3. General account of Ginkgoales.
4. Economic importance and evolutionary trends of Gymnosperm.

TAXONOMY

1. The Species Concept

Taxonomic hierarchy, Concept of Species, Genus and Family and other categories; Principles used in assessing relationship. Delimitation of Taxa and attribution of Rank; International Code of Botanical Nomenclature (ICBN).

2. **Recent trends in Taxonomy** with special reference to Numerical taxonomy, Palynotaxonomy, Chemotaxonomy and Cyto-taxonomy Molecular taxonomy.
3. **Phytogeography**: Principal bio-geographical zones, Endemism
4. **Distinctive Taxonomic features and economic importance of following families:**

Magnoliaceae Apocynaceae, Asclpiadaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Lamiaceae, Euphorbiaceae, Rubiaceae, Cyperaceae & Poaceae.

SEMESTER II
CORE COURSE V
EMBRYOLOGY, ANATOMY & ECONOMIC BOTANY

Full Marks:70

Credits: 6

Time:03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

EMBRYOLOGY

1. Microspore and Microsporogenesis; Megaspore and Megasporogenesis
2. Development of male and female gametophyte
3. Germination of pollen grains, path of pollen tube and its entry
Into embryo sac, double fertilization and pollen-pistil interaction
4. Endosperm and its types, morphological nature of endosperm
5. Embryogenesis, development of monocot and dicot embryo
6. Apomixis and polyembryony

ANATOMY

1. Organization of shoot apical meristem (SAM) and root apical meristem (RAM).
2. Mechanical tissue and their distribution, cambium and their role in growth.
3. Anomalous secondary growth (*Boerhavia*, *Nyctanthus*, *Achyranthus*,
Aristolochia, *Tinospora*, *Dracaena*)
4. Periderm: Formation, function and healing of wounds.
5. Stomata: morphology, different types and ontogeny

ECONOMIC BOTANY

1. Origin, evolution, botany, cultivation and uses of ; (a) food crops, (b) fiber, forage and Fodder crops, (c) medicinal and aromatic plants, (d) vegetables and oil yielding crops
2. Plants yielding timber, tannins, dyes, resins and fruits
3. Plants used as revenue trees for shade, pollution control and aesthetics

SEMESTER II
PRACTICAL VI

TIME: 6 Hrs

F.M.: 100

Practical based on theory

SEMESTER III

Core Course VII

PLANT PHYSIOLOGY, BIOCHEMISTRY

Full Marks: 70

Credits: 6

Time: 03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

PLANT PHYSIOLOGY & BIOCHEMISTRY

1. Absorption of minerals: anatomy of root, soil profile and soil water, mechanism of absorption: active and passive; factors affecting absorption, Mineral nutrition of plants, deficiency symptoms and diseases, macro and micro nutrients, chelating agents
2. Translocation of solutes: substances translocated in phloem, direction and speed of translocation, mechanism of phloem transport, transport of ions; factors affecting translocation
3. Photosynthesis : Pigment system, Photophosphorylation, Calvin cycle, Hatch & Slack pathway , CAM pathway, photorespiration, factors affecting rate of photosynthesis
4. Respiration : Glycolysis, Fermentation, Kreb's cycle, Electron Transport System, Hexose monophosphate shunt, theories of phosphorylation, factors affecting rate of respiration. Degradation of fats: beta-oxidation & alpha-oxidation, glyoxylate cycle.
5. Plant growth regulators (Phytohormones): structure, biosynthesis, physiological responses and mechanism of action of Auxins, Gibberellins, Cytokinins, Ethylene Abscissic acid
6. Enzymes : nature properties & classification, enzyme energetic (Michaelis-Menten equation), mode & mechanism of action, factors affecting enzyme activities. General aspects, prosthetic groups and coenzymes, mechanism of catalysis, kinetics.
7. Nitrogen metabolism: amino acid metabolism, protein synthesis in pro & eukaryotes, genetic code polypeptide chain, nitrogen fixation in free living and symbiotic bacteria
8. Stress physiology– Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses
9. Sensory photobiology- Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks.

SEMESTER III

Core Course VIII

CYTOLOGY & MOLECULAR BIOLOGY

Full Marks: 70

Credits: 6

Time: 03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

CYTOLOGY

1. Cell membrane: Structure, function and models. Cell wall: Concept, structural organization.
2. Mitochondria: Structure, genome organization, protein import and mitochondrial assembly
3. Chloroplast: Structure, genome organization, import and sorting of chloroplast proteins
4. Endoplasmic reticulum: Structure, translocation of secretory proteins across ER membrane, insertion of protein into ER membrane, protein folding and processing.
- 5 Golgi apparatus: Organization, protein glycosylation, protein sorting and export from Golgi, the vesicular transport mechanism.
- 6 Nucleus: Nuclear envelope, nuclear pore complex, trafficking between nucleus and cytoplasm

MOLECULAR BIOLOGY

- 1 Gene and genome: Fine structure of gene, genome organization
- 2 DNA/gene manipulating enzymes: Endonuclease, exonuclease, ligase, polymerase, phosphatase, transcriptase, transferase, topoisomerase
- 3 DNA replication: Various models, speed of replication, collaboration of proteins, process and termination of replication
- 4 Control of gene expression at transcription and translation level (regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing)

5 Genetic recombination: Holliday, Potter & Dressler, Meselson and Radding and Szostak model of genetic recombination

6 Gene cloning: Cloning vectors, molecular cloning and construction of DNA libraries

7 Mobile genetic elements: Insertion elements, transposons.

SEMESTER III

Core Course IX

GENETIC ENGINEERING & BIOTECHNOLOGY

Full Marks: 70

Credits: 6

Time: 03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

GENETIC ENGINEERING

1. Tools of Genetic Engineering: Restriction endonuclease, gel electrophoresis, ligases, probes, cloning vectors: plasmids, cosmids, phage vectors, BAC, YAC vectors.
2. Nucleic Acid Hybridization: Northern, Southern, and Western blotting techniques.
3. Gene Transformation In Plants: vector mediated gene transformation, Agrobacterium the natural genetic engineer, methods of direct gene transfer in plants, Transgenic plants, T DNA, Z DNA
4. Techniques in cell biology: Immunotechniques, in situ hybridization to locate transcripts in cell types, FISH, GISH, Confocal microscopy

BIOTECHNOLOGY

1. Biotechnology basic concepts, principles and scopes.
2. Plant cell and tissue culture: Concept of cellular differentiation and totipotency, clonal propagation, artificial seeds, somaclones, production of secondary metabolites/natural products, cryopreservation and germplasm storage
3. Recombinant DNA technology: Gene transfer
4. Basic concept of genomics and proteomics

SEMESTER III
PRACTICAL X

TIME: 6 Hrs

F.M.: 100

Practical based on theory

SEMESTER IV
CORE COURSE XI
PLANT ECOLOGY

Full Marks: 70

Credits: 6

Time: 03 Hour

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

1. Climate, soil and vegetation pattern of the world: Life zones: major biomes and major vegetation and soil types of the world.
2. Population concepts: Characteristics, dynamics and control
3. Vegetation organization and characteristics: Concepts of community and continuum; community coefficients, interspecific associations, ordination; ecological niche; species diversity (α , β , γ)
4. Ecological succession: Models and mechanisms of ecological succession; changes in ecosystem properties during succession
5. Ecosystem organization: Structure and functions; primary production (methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization, energy flow pathways); decomposition (mechanism, controlling factors); ecosystem nutrient cycles
6. Ecosystem stability: Concept (resistance and resilience); ecological perturbations (natural and anthropogenic) and their impact on plants and ecosystems; ecology of plant invasion
7. Biological diversity: Concept and levels; distribution and global patterns; terrestrial biodiversity hot spots; role of biodiversity in ecosystem functions; IUCN categories of threat; inventory; conservation, protected area network
8. Environmental pollution: Kinds, sources, effects on plants and ecosystems
9. Global change: Greenhouse gases, consequences of climate change; ozone layer depletion, causes and consequences

SEMESTER IV
SPECIAL PAPER XII
PLANT PATHOLOGY

Full Marks: 70

Credits: 6

Time: 03 Hours

In all **eight (08)** questions of equal value will be set, out of which a student shall have to answer five questions. Question No. 1 will be compulsory and should ask for a self-explanatory well labelled diagram on any topic from the syllabus and will carry 10 marks. Any four questions shall have to be answered by the examinees out of the remaining seven questions carrying 15 marks each.

1. History and modern approaches to plant pathology
2. General symptoms of plant diseases caused by fungi
3. Mode of attack:
 - (a) Enzymes: role of enzymes in pathogenesis
 - (b) Toxins: types and their role in pathogenesis
4. Physiology of diseased plants with special reference to:
 - (a) Osmo-regulation
 - (b) Respiration
 - (c) Photosynthesis
 - (d) Nitrogen and phenol metabolism
5. Mechanism of defense:
 - (a) Structural defense mechanism
 - (b) Biochemical defense mechanism
6. Control measures of plant diseases:
 - (a) Cultural practices
 - (b) Biological
 - (c) Chemical control (fungicide)
7. Plant quarantine
8. Important plant diseases caused by the fungi (symptoms, etiology and control):
 - (a) Downy mildew of maize
 - (b) Powdery mildew of pea
 - (c) Loose smut of wheat
 - (d) Covered smut of barley
 - (e) Whip-smut of sugarcane
 - (f) Linseed rust
 - (g) Tikka disease of groundnut

- (h) Wilt of arhar
- (i) Blast of rice
- (j) False smut of rice
- (k) Red rot of sugarcane
- (l) Early blight of potato

9. Important diseases of Bacteria:

10. Important viral diseases:

11. Important diseases caused by Nematodes:

SEMESTER IV
PRACTICAL XIII

TIME: 6 Hrs

F.M.: 100

Practical based on theory

SEMESTER IV
PAPER XIV
DISSERTATION

BASED ON THEORY PAPERS