



YBN UNIVERSITY

Established by the Act of Government of Jharkhand Act 15, 2017

Gazette Notification No. 505, Dated 17th July 2017

As per Section 2(f) of UGC Act. 1956

YBN UNIVERSITY- RANCHI

SYLLABUS FOR MASTER IN SCIENCE



BOTANY

SEMESTER SYSTEM

(2020)

**APPROVED BY
THE BOARD OF STUDIES
UNIVERSITY DEPARTMENT OF BOTANY
YBN UNIVERSITY, RANCHI (JHARKHAND)**

YBN UNIVERSITY

Established by the Act of Government of Jharkhand Act 15, 2017

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COURSE STRUCTURE OF M.Sc. UNDER CBCS, 2020
YBN UNIVERSITY- RANCHI

COURSE STRUCTURE OF M.Sc. BOTANY FIRST SEMESTER													
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional		L	T	P	Subject-wise Distribution
				Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks				
1Y2 BOT 101	Foundation Course(Compulsory)	Plant Diversities	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 102	Core Course-I	Biology of Gymnosperms, Fossils, Microbiology and Plant Pathology	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 103	Core Course-II	Plant Anatomy and Embryology	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 104P	Core Course-III Practical	Practical of FC, CC-01 and CC-02	100	50	17	20	07	30	10	-	-	10	5
Grand Total			400										20

COURSE STRUCTURE OF M.Sc. BOTANY SECOND SEMESTER													
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional		L	T	P	Subject-wise Distribution
				Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks				
1Y2 BOT 201	Elective Course-I	EC-I	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 202	Core Course-IV	Cell Biology and Cytogenetic	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 203	Core Course-V	Plant Physiology and Biochemistry	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 204P	Core Course VI- Practical	Practical of EC-I, CC-IV and CC-V	100	50	17	20	07	30	10	-	-	10	5
Grand Total			400										20

COURSE STRUCTURE OF M.Sc. BOTANY THIRD SEMESTER

Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional		L	T	P	Subject-wise Distribution
				Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks				
1Y2 BOT 301	Core Course - VII	Ecology and Environmental Biology	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 302	Core Course -VIII	Plant Biotechnology & Bioinformatics	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 303	Elective Course -II	EC-II	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 304P	Core Course IX- Practical	Practical of CC-VII, CC-VIII and EC-II	100	50	17	20	07	30	10	-	-	10	5
	Grand Total		400										20

COURSE STRUCTURE OF M.Sc. BOTANY FOURTH SEMESTER

Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional		L	T	P	Subject-wise Distribution
				Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks				
1Y2 BOT 401	Core Course -IX	Plant Breeding & Cytogenetics	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 402	Elective Course -III	Elective Course-III	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 403	Elective Course -IV Practical	Elective Course-IV Practical	100	50	17	20	07	30	10	5	1	-	5
1Y2 BOT 404P	Project	Dissertation/ Project	100	-	-	-	-	-	-	-	-	10	5
	Grand Total		400										20

Minimum Passing Marks are equivalent to Grade D
Lectures T- Tutorials P- Practical, Major- Term End Theory Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50%

Elective Course-I: Plant Physiology and Biotechnology
Elective Course-II: Plant Taxonomy, Ethnobotany and Medicinal Plants
Elective Course-III: Ecology & Environmental Biology
Elective Course-IV: Algal Biology and Algal Biotechnology

SYLLABUS FOR M.Sc. BOTANY
YBN UNIVERSITY- RANCHI
FIRST SEMESTER (SEM I)

FC-01 BOT: Plant Diversities

Group A: Phycology

1. Classification (up to Orders): as proposed by Fritsch (1935).
2. Range of thallus organization, pigment, origin and evolution of sex and economic importance of algae.
3. A general account on structure, reproduction, ecology and phylogenetic relationships of Cyanophyta, Chlorophyta, Charophyta, Phaeophyta and Rhodophyta.

Group B: Fungi and Lichens

4. Status of fungi – Kingdom Fungi: General characters, nutrition, reproduction.
5. Classification of Fungi as proposed by Mims (1979)
6. General account of the following sub-divisions with special reference to the orders mentioned against them :
 - a) Mastigomycotina – Peronosporales
 - b) Zygomycotina – Mucorales
 - c) Ascomycotina – Erysiphales,
 - d) Basidiomycotina – Uredinales, Ustilaginales, Agaricales.
 - e) Deuteromycotina – Moniliales
7. Heterothallism and parasexuality
8. Importance of fungi in agriculture and industry

Group C: Bryophytes

9. Classification as proposed by Smith (1955), Parihar (1965)
10. General characters, range of thallus organization, reproduction and evolutionary trends in following class with special reference to orders against them:
Hepaticopsida : Marchantiales,
Antherotopsida : Anthocerotales
Bryopsida : Sphagnales, Funeriales
11. Progressive sterilization of sporogenous tissue in Bryophytes

SYLLABUS FOR M.Sc. BOTANY
YBN UNIVERSITY- RANCHI
FIRST SEMESTER (SEM I)

CC-01 BOT: Biology of Pteridophytes, Gymnosperms, Microbiology and Plant Pathology

Group A: Pteridophytes

1. Classification of Pteridophytes as proposed by Sporne (1975).
2. Origin and evolution of Pteridophytes: Telome Concept
3. Evolution of stele in Pteridophytes.
4. Heterospory and origin of seed habit.
5. Study of morphology, anatomy and reproduction of Psilopsida, Lycopsida and Pteropsida.

Group B: Gymnosperms and Fossils

6. Classification of Gymnosperms as proposed by Sporne (1965).
7. Distribution and economic importance
8. Structure and reproduction in Pteridospermales, Pentoxylales, Cycadales, Ginkgoales, Coniferales, Ephedrales and Gnetales
9. Fossil: Distribution with special reference to Jharkhand, Process of fossilization, Geological time scale

Group C: Microbiology and Plant Pathology

10. Morphology and ultrastructure of bacteria. Nutritional types (autotrophs and heterotrophs), growth and reproduction in bacteria.
11. Basic concepts of recombination in bacteria (transformation, transduction and conjugation).
12. General properties of viruses, concept of virioids, satellite viruses and prion.
13. Structure of viruses.
14. Brief account of bacteriophages, their multiplication and replication strategies.
15. Economic Importance of viruses and bacteria.
16. Symptoms, etiology and disease management of the following:
 - a) Early Blight of Potato.
 - b) Tikka Disease of Groundnut.
 - c) Wilt of Arhar.
 - d) Red Rot of Sugarcane

SYLLABUS FOR M.Sc. BOTANY
YBN UNIVERSITY- RANCHI
FIRST SEMESTER (SEM I)

CC-02 BOT: PLANT ANATOMY AND EMBRYOLOGY

GROUP A: PLANT ANATOMY

1. Plant Tissues and Tissue system.
2. Shoot development; Organization of the shoot, apical meristem (SAM)
3. Dormant and active vascular cambium and its abnormal activity.
4. Wood development in relation to environmental factors.
5. Leaf growth and differentiation; determination phyllotaxy,
6. Epidermis with special reference to stomata and trichomes.
7. Root development: Organization of root apical meristem (RAM)

GROUP B: PLANT EMBRYOLOGY

8. Microsporangium: Microsporogenesis, Anther Wall, Endothecium Middle layers, Tapetum, Nuclear behaviour in tapetal cells, Sporogenous tissue.
9. Male Gametophyte: Pollen wall, Formation of vegetative and generative cells, Formation of Sperms, Abnormal features.
10. Megasporangium: Types of ovule, Integuments, Nucellus, Megasporogenesis, Special features.
11. Female Gametophyte: Types of female gametophytes, Mature Embryo sac, Haustorial behavior of embryo sac, Nutrition of Embryo sac.
12. Pollination: Anther dehiscence, pollen transfer, self pollination, cross pollination, artificial pollination, pollen storage;
13. Fertilization: Pollen germination and pollen tube growth. Path of pollen tube, pollen tube discharge, Double fertilization, Syngamy.
14. Endosperm: Types of endosperm: ruminant endosperm, cytology of endosperm, functions of endosperm.
15. Embryo: Zygote, Proembryo, Embryogeny in dicotyledons, Embryogeny in monocotyledons, suspensor, under developed and reduced embryos, Nutrition of embryo.
16. Polyembryony: Causes of Polyembryony, classification of Polyembryony, experimental induction of Polyembryony, practical value of Polyembryony.
17. Apomixis: Vegetative reproduction, apospory, causes of Apomixis, significance of Apomixis

SYLLABUS FOR M.Sc. BOTANY
YBN UNIVERSITY- RANCHI
SECOND SEMESTER (SEM II)

EC-01 BOT: CELL BIOLOGY, CYTOGENETICS AND MOLECULAR BIOLOGY OF PLANT

Group A: Cell biology

1. Prokaryotic and Eukaryotic Cells: Ultrastructure of Prokaryotic and Eukaryotic cells
2. Cell wall, the Extracellular matrix
3. Biomembranes: Structure and functions of biomembranes
4. Organelles of eukaryotic cell; Chloroplast, Mitochondria, Endoplasmic Reticulum, microtubules, peroxisomes, Golgi apparatus, lysosomes, plant vacuoles and ribosome.
5. The Nucleus, Nuclear Envelope, nuclear pore complex.

Group B: Cytogenetics

6. Ultrastructure of prokaryotic and eukaryotic chromosome- Euchromatin and heterochromatin. Chromosome banding, Polytene, Lampbrush, B chromosomes, and Sex chromosomes. Karyotype study in relation to taxonomy.
7. Mendelism
8. Mutation
9. Chromosomal aberration – Structural and Numerical
10. Organization and function of mitochondrial and chloroplast genome, diversity and evolution of organelle genome.
11. Cell division: Mitosis, Meiosis.
12. Cell cycle and its regulation, role of cyclins and cyclin dependant kinase,

SYLLABUS FOR M.Sc. BOTANY
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SECOND SEMESTER (SEM II)

CC-04 BOT: TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

1. Plant taxonomy: objective and scope, hierarchal categories of taxonomy. Salient features of the International Code of Nomenclature for algae, fungi, and plants (Melbourne Code).
2. Angiosperm classification: outlines, relative merits and demerits of some major systems of classifications: Linnaeus, Hutchinson, Engler and Prantl, Bentham and Hooker, Takhtajan.
3. Taxonomic evidence: Morphology, Anatomy, Palynology, Embryology, Cytology, Phytochemistry.
4. Diagnostic characteristics, systematic phylogeny and economic importance of families: Ranunculaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Verbenaceae, Euphorbiaceae, Rubiaceae, Orchidaceae, Poaceae, Commelinaceae and Liliaceae.
5. Taxonomic tools: Field and Herbarium techniques, Floras, Botanical gardens (National and International).
6. Plant Introduction.
7. Plants of economic importance: timber, fiber, oil, beverage, gum, rubber and spices.

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SECOND SEMESTER (SEM II)

CC-05 BOT: PLANT PHYSIOLOGY AND BIOCHEMISTRY

GROUP A: PLANT PHYSIOLOGY

1. Photosynthesis: Light harvesting complexes. PS I and PSII- structure and function. CO₂ fixation: C₃, C₄ and CAM pathways.
2. Respiration: Glycolysis, fermentation, Krebs cycle, Electron transport system, Hexose Monophosphate shunt, oxidative phosphorylation, factors affecting rate of respiration.
3. Photorespiration and glycolate metabolism, factors regulating photorespiration.
4. Essential nutrients, deficiencies and plant disorders; Mechanisms of Solute transport, Transpiration
5. Plant photomorphogenesis: Phytochromes and Cryptochrome,
6. Physiology of flowering, vernalization. Photoperiodism,
7. Plant growth regulators and their mode of action: Auxin, Cytokinin, Gibberellins, ABA, Ethylene

GROUP B: BIOCHEMISTRY

8. Structure, function and metabolism of biomolecules
 - a) Carbohydrates- Chemical structure, nature and properties, classification and importance in biological cells
 - b) Amino acids and proteins- Chemical structure, nature and properties, classification, proteolysis, transamination, deamination
 - c) Lipids - Saturated and unsaturated fatty acids, structure, classification, properties and function of lipids, β -oxidation of lipids.
9. Enzyme: Nomenclature and classification, Nature and structural properties, Enzyme kinetics- Energy of Activation, catalytic site, Interaction of enzyme substrate, K_m, Inhibition, Activation. Factors affecting Enzyme activity, Isozymes, abzymes.
10. Nitrogen Fixation: Physiology of nitrogen cycle. Non biological fixation, biological nitrogen fixation, Non-symbiotic Nitrogen fixation. Mechanism of nitrogen fixation, genetics of nitrogen fixation, synthesis and regulation of nitrogenase.

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THIRD SEMESTER (SEM III)

CC-07: ECOLOGY AND ENVIRONMENTAL BIOLOGY

GROUP A: ECOLOGY

1. Structure and function of ecosystem: Biotic and abiotic components, energy flow, ecological pyramids, food chains and food webs, major types of ecosystems, homeostasis. Global biogeochemical cycles of Carbon, Nitrogen, Phosphorous, Sulphur.
2. Population Ecology: population characteristic and population dynamics
3. Community ecology: characteristic, composition, structure, origin and development of communities.
4. Ecological succession: causes, types, mechanism, climax concept.
5. Basic principles, age and area theory, centre of origin theory, endemism, plant migration and continental drift.
6. Phytogeography: major biomes, soils of India, climatic regions of India, major vegetational belts and vegetation patterns in India.

GROUP B: ENVIRONMENTAL BIOLOGY

7. Environmental pollution: Air, Water, Soil and Radioactive pollution- causes, effects and control measures, pollution case studies, Green Data Book.
8. Climate and climate change: Basic idea about atmosphere and its parameters, causes of climate change, Green house gases, Acid Rain, Smog, Ozone layer depletion, Global warming.
9. Ecological Management: Concept of sustainable development, Forest conservation and soil conservation, Chipko movement.
10. Energy Resources: Conventional and Non –Conventional
11. Biodiversity: Definition, levels, threats and conservation of biodiversity, Biosphere Reserves, Keystone species, Hotspot of Biodiversity, IUCN, Categories of threatened species, Red Data Book.

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THIRD SEMESTER (SEM III)

CC-08: Molecular Biology

1. Chemistry of the gene: Evidence for DNA as genetic material, Physical and chemical structure of DNA, Eukaryotic genome – Repeated DNA sequences, C value and C value paradox. C_{ot} curves.
2. Mechanism of DNA replication, DNA damage and DNA repair mechanisms.
3. Gene Expression: Transcription in prokaryotes and Eukaryotes, mRNA processing and other RNA processing events, RNA splicing.
4. Genetic code, protein biosynthesis, Targeting of proteins to organelles.
5. Gene regulation: Principles of gene regulation, gene regulation in prokaryotes (e.g. lactose and tryptophan operons), Strategies of gene regulation in Eukaryotes (DNA methylation only).
6. Transposons, mechanism of transposition, IS elements, genetic consequences of transposition.
7. Signal transduction: Overview, second messenger, receptors and G proteins, phospholipids signaling, role of cyclic nucleotides, Calcium calmodulin cascade, protein kinase and phosphatase.

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YBN UNIVERSITY- RANCHI

THIRD SEMESTER (SEM III)

EC-02 BOT: SPECIAL PAPERS (ONLY ONE TO BE SELECTED)

A. Algal Biology and Algal Biotechnology

B. Microbiology and Plant Pathology

**C. Cytogenetics, Plant Breeding, Molecular Biology and
Biotechnology D. Plant Physiology and Biotechnology**

E. Plant Taxonomy, Ethnobotany and Medicinal Plants

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YBN UNIVERSITY- RANCHI

THIRD SEMESTER (SEM III)

EC-02 BOT: SPECIAL PAPER: A. ALGAL BIOLOGY AND ALGAL BIOTECHNOLOGY

Group A: ALGAL BIOLOGY

1. Principles and systems of classification by Chapman and Round.
2. Cyanophyceae: Cell structure and thallus organization, heterocyst and akinete development and their role chromatic adaptation and reproduction.
3. Chlorophyceae: Range of thallus organization, methods of reproduction and perennation and life cycle.
4. Life cycle patterns and alternation of generation with particulars reference to Pheophyceae and Rhodophyceae.
5. Nuclear characteristics of green algae & blue green algae.
6. A detailed idea of algae causing diseases of plants and animals.
7. Algae and water pollution: Physico-chemical analysis of water bodies, pollution indices and pollution indicators and steps to control pollution.

Group B: ALGAL BIOTECHNOLOGY

8. Cyanobacteria in human welfare: Production of fine chemicals polysaccharides bioactive molecules pigments, and lipids.
9. Recent Biotechnological developments with algae as experimental material.
10. Role of algae in biological nitrogen fixation.
11. Culture of algae: Media preparation.
12. Methods of collection, isolation and cultural procedure for green algae and blue green algae.
13. Economic importance of Algae as : (i) Food (ii) Feed (iii) Bio-fertilizer (iv) Algae in agriculture and industry (v) Hydrogen production by algae.
14. Molecular biotechnology with special reference to blue green algae.

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YBN UNIVERSITY- RANCHI

THIRD SEMESTER (SEM III)

EC-02 BOT SPECIAL PAPER: B. MICROBIOLOGY AND PLANT PATHOLOGY

Group A: PLANT PATHOLOGY

1. History and Modern Approaches of Plant Pathology.
2. General Symptoms of Plant diseases caused by Fungi.
3. Mode of Infection and Pathogenesis.
4. Mechanism of Attack: Enzymes – Role of Enzymes in Pathogenesis.
Toxins – Types and their role in Pathogenesis.
Wilting and its Mechanism.
5. Mechanism of Defense: Structural Defense Mechanism.
Chemical Defense Mechanism.

Group B: PLANT DISEASE & MANAGEMENT

1. Management of Plant Diseases.
2. Chemical control (fungicides)
3. Quarantine.
4. Biological Control.
5. Integrated Pest management.
6. Symptoms, causal organism and control measure of the following types of fungal diseases of Jharkhand:
 - a) Blights
 - b) Mildews
 - c) Rusts
 - d) Smuts
 - e) Wilts
 - f) Rots

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

THIRD SEMESTER (SEM III)

EC-02 BOT SPECIAL PAPER: C. CYTOGENETICS

Group A: CYTOGENETICS

1. Structure and organization of the nucleus.
2. Accessory chromosomes: Structure, cytological behavior, significance, and effects.
3. Heterochromatin and Euchromatin.
4. Karyotype analysis and karyotype evolution.
5. Molecular basis of chromosome pairing.
6. Linkage three- point test- cross and crossing over.
7. Genetics of mitochondria and chloroplast.

Group B: MOLECULAR GENETICS

8. Mutation: Spontaneous and induced mutation, Mutagens and mechanism of mutation.
9. Effect of various kinds of radiations on plant cell, chromosome and DNA.
10. Insertion elements and transposons: Transposons in prokaryotes, mechanism of transposition, genetic organization of TnA and its role in transposition, DNA replication in and eukaryotes.
11. RNA processing, RNA splicing, RNA editing and ribozymes.
12. Genetic engineering: Restriction endonucleases, Isolation DNA.
13. Gene cloning vectors, plasmids, cosmids, phagemids, bacteriophages, PCR (cloning and amplification of DNA).
14. DNA and genomic library, transgenic plants.

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

THIRD SEMESTER (SEM III)

EC -02 BOT: SPECIAL PAPER: D. PLANT PHYSIOLOGY AND BIOTECHNOLOGY

Paper X: PHYSIOLOGY OF PLANT GROWTH AND DEVELOPMENT

1. Definition of growth, development and differentiation.
2. Growth regulators (phytohormones): history, structure, biosynthesis, physiological responses and mechanism of action of Auxins, Gibberellins; Cytokinins; Ethylene; Abscissic acid, Brassinosteroids, Jasmonic acid and Salicylic Acid.
3. Apical dominance and various theories.
4. Polarity.

Paper XI: PHYSIOLOGY OF PLANT GROWTH AND DEVELOPMENT

5. Photomorphogenesis: Phytochrome, History of its discovery, isolation, purification and its biological roles.
6. Physiology of flowering: Photoperiodism and Vernalization.
7. Seed dormancy: definition, types, mechanism and method of breaking the dormancy.
8. Seed Germination.
9. Movement: Detail studies of Phototropism, Geotropism, Seismonastic and Nastic movements.
10. Stress Physiology: Water deficit and its physiological consequences, drought tolerance mechanisms, salinity stress and plant responses, heat stress and heat shock proteins, Biotic stress, HR and SAR mechanisms

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

THIRD SEMESTER (SEM III)

EC-02 BOT: SPECIAL PAPER: E. PLANT TAXONOMY AND ETHNOBOTANY

Group A: PLANT TAXONOMY

1. Angiosperm classification: outlines, relative merits and demerits of some major systems of classifications: Linnaeus, Hutchinson, Engler and Prantl, Bentham and Hooker.
2. Taxonomic Evidence: Morphological, Anatomical, Chemical, Embryological and Cytological.
3. Botanical nomenclature: International Code of Nomenclature for algae, fungi, and plants (Melbourne Code), Principles, Rules and Recommendations, Priority, Typification, Rules of effective and valid publications, Retention and Choice of names.
4. Concepts of Phytogeography: Endemism, hotspots, plant introduction and invasions.
5. Study of important angiospermic plant families of Jharkhand: Magnoliaceae, Rutaceae, Rubiaceae, Apocynaceae, Convolvulaceae, Solanaceae, Scrophulariaceae, Verbenaceae, Euphorbiaceae, Orchidaceae, Cyperaceae and Poaceae.

Group B: ETHNOBOTANY

6. Definition, scope and method of study of Ethnobotany.
7. The ethnic society of India, ethnobotanical contribution of the tribal of India.
8. Ethnobotanical documentation of traditional medicine: from past to present.
9. Preliminary knowledge about ethnobotany of Oraon, Munda, Ho and Santhals.
10. Important tribes and ethnic groups of Jharkhand. (Their distribution, habit and languages).
11. Study of some ethno-medicinal plants of Jharkhand.

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

FOURTH SEMESTER (SEM IV)

CC-10 BOT: BIOSTATISTICS, PLANT BIOTECHNOLOGY AND BIOINFORMATICS

1. Concept of statistical analysis in Biology, Ideas about Mean, Mode, Median Standard Deviation, Probability, Correlation and Trends (measure of central tendency).
2. Ideas about level of significance, Regression, and Correlation, t-test, ANOVA, chi-square test, f-test
3. Methods of DNA, RNA and Protein analysis- Isolation and purification of DNA, RNA and protein, Agarose gel electrophoresis, Isoelectric focussing, Southern - and Northern - blotting techniques, DNA microarray analysis. SDS-PAGE and Western blotting., PCR, DNA finger printing, RT-PCR.
4. Construction of Genomic and cDNA libraries: Genomic and cDNA libraries.
5. Molecular cloning: Restriction and nucleic acid modifying enzymes; restriction mapping, choice of vectors; plasmids, phages, cosmids, plant viruses, synthetic DNA vectors
6. DNA sequencing and synthesis: Maxam-Gilbert's and Sanger's method. Automated sequencing.
7. Bioinformatics.
8. Intellectual Property Rights.
9. Histochemical immunotechniques – RIA, Western blot, Flowcytometry, Immunofluorescence microscopy, ELISA, FISH, GISH.
10. Introduction to plant tissue culture: History, concepts of cell differentiation and totipotency; pathways for *in vitro* regeneration: organogenesis, somatic and gametic embryogenesis. Organization of laboratory media, composition and preparation, aseptic manipulation. Cell culture and its application (mutant selection, production of secondary metabolites).
11. Production of haploids: Anther culture, Ovule culture, Bulbosum techniques. Detection of haploids (Morphology, genetic markers).
12. Principles, methods and applications of genetic transformations: *Agrobacterium* biology and biotechnology; Plant - *Agrobacterium* interactions; Direct gene transfer methods: particle bombardment, electroporation, marker and reporter genes; case studies of transgenic traits in plants.

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

FOURTH SEMESTER (SEM IV)

EC-03 BOT SPECIAL PAPERS (SELECTED EARLIER IN SEMETER III)

A. Algal Biology and Algal Biotechnology

B. Microbiology and Plant Pathology

**C. Cytogenetics, Plant Breeding, Molecular Biology and
Biotechnology**

D. Plant Physiology and Biotechnology

E. Plant Taxonomy, Ethnobotany and Medicinal Plants

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FOURTH SEMESTER (SEM IV)

**EC-03 BOT-3: SPECIAL PAPER: A. ALGAL BIOLOGY
AND ALGAL
BIOTECHNOLOGY**

Group A: ALGAL METABOLISM AND MOLECULAR BIOLOGY OF CYANOBACTERIA

1. Photo-biological nitrogen fixation: Introduction genetic structure of N₂ fixation system, heterocyst differentiation, nitrate, nitrite and ammonia assimilation.
2. Biochemical and molecular aspects of abiotic stresses.
3. UV radiation
4. Temperature and desiccation stress.
5. Salinity.
6. Photoprotective Mechanisms-Habitat diversity and significant physiological properties.
7. Cyanobacterial Genetics: Modes of propagation in Cyanobacteria and nature of genetic material.

Group B: APPLIED PHYCOLOGY

8. Nutrient regulated phytoplankton growth: Common methods for mass cultivation of micro-algae.
9. Eutrophication: Causal factor, algal blooms.
10. Commercial production of *Spirulina*, *Scenedesmus*, *Chlorella*.
11. Paddy field Cyanobacteria: Qualitative and quantitative assessment and their biodiversity using molecular tools, their use as bio-fertilizer.

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

FOURTH SEMESTER (SEM IV)

EC BOT – 3: SPECIAL PAPER: B. MICROBIOLOGY AND PLANT PATHOLOGY

Group A: MICROBIOLOGY

1. Role of Microbes in Agriculture Industry and Medicines.
2. Mycorrhiza – a general account and its role.
3. Microbes pathogenic to human beings with special reference to AIDs, Cancer, Tuberculosis and Malaria.
4. Symptoms caused by:
 - a) Plant Pathogenic bacteria.
 - b) Plant viruses.
 - c) Mycoplasma.

Group B: DISEASE & MANAGEMENT

5. Important plant diseases caused by plant pathogenic bacteria-
 - a) Bacterial Blight of Cotton.
 - b) Bacterial leaf streak of rice.
 - c) Bacterial blight and canker of Mango.
6. Important Plant diseases caused by plant viruses & mycoplasma.
7. Bunchy top of Banana.
8. Rice tungro virus.
9. Sugarcane mosaic.
10. Grassy shoot of Sugarcane.

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YBN UNIVERSITY- RANCHI

FOURTH SEMESTER (SEM IV)

EC-03 BOT – 3: SPECIAL PAPER: C. CYTOGENETICS, PLANT BREEDING, MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Group A: PLANT BREEDING

1. Principle and objectives of crop improvement.
2. Theory of Centre of origin of crop plants.
3. Plant Genetic Resources
4. Plant introduction and acclimatization, procedure and purpose- merits and demerits.
5. Self-incompatibility system/s.
6. Inbreeding and Heterosis.
7. Male sterility and its significance.
8. Mutation Breeding.
9. Genetic Engineering and Crop Improvement
10. Reproductive systems in crop plants

Group B: PLANT BIOTECHNOLOGY

11. Principle of plant tissue culture
12. Uses of haploids in plant breeding: hybrid sorting, homozygous lines, analytical and synthetic breeding.
13. Transgenic plants for crop improvement (dicots and monocots); resistance to herbicides and insecticides.
14. *In vitro* fertilization and its significance
15. Synthetic seeds
16. Protoplast culture and somatic hybridization- techniques, factors, limitation and its role in crop improvement

SYLLABUS FOR M.Sc. BOTANY

YBN UNIVERSITY- RANCHI

FOURTH SEMESTER (SEM IV)

EC-03 BOT: SPECIAL PAPER: D. PLANT PHYSIOLOGY AND BIOTECHNOLOGY

Group A: TISSUE CULTURE

1. History of plant tissue culture, significance and its present status in India.
2. Pathway of differentiation: Embryogenesis and Organogenesis.
3. *In vitro* fertilization and its significance.
4. Suspension culture and single cell culture.
5. Haploidy: Anther culture, Pollen culture, Ovary culture and its significance.
6. Endosperm culture.
7. Protoplast culture and Somatic hybridization-technique, factors, limitation and its role in crop improvement.
8. Micro-propagation: Technique, factors, limitation and its significance.
9. Cryopreservation: history, technique and future aspects.

Group B: BIOTECHNOLOGY

10. Biotechnology: Basic concept, principle and scope.
11. Recombinant DNA technology – gene cloning principle and techniques.
12. DNA finger printing, polymerase chain reaction.
13. Genetics of *Agrobacterium tumefaciens* and *A. rhizogenes*.
14. Plasmid mediated and DNA Mediated Genetic Transformation (DMGT) and production of transgenic plants.
15. Secondary metabolite enhancement through tissue culture technique.
16. Synthetic seeds.

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FOURTH SEMESTER (SEM IV)

EC-03 BOT: SPECIAL PAPER: E. PLANT TAXONOMY, ETHNOBOTANY AND MEDICINAL PLANTS

Group A: PLANT TAXONOMY

1. Outline of classification of angiosperms: Cornquist's and Takhtajan's classifications: their merits and demerits. Brief introduction to APG III system of classification. Phenetic and phylogenetic methods in systematics.
2. Origin of Angiosperms: The first traces of angiosperms. The nature of probable ancestors of angiosperms. The mono- and polyphyletic origin of angiosperms. The origin of monocotyledons.
3. Taxonomic tools: Herbarium techniques, Floras, Computers, Remote sensing and GIS.
4. Molecular approaches in plant taxonomy: Application of DNA markers in angiosperm taxonomy, molecular phylogeny.
5. Important angiosperm families: Ranunculaceae, Meliaceae, Dipterocarpaceae, Caesalpiniaceae, Fabaceae, Myrtaceae, Asteraceae, Asclepiadaceae, Acanthaceae, Lamiaceae, Liliaceae and Commelinaceae.

GROUP B: MEDICINAL PLANTS

1. Floristic diversity and medicinal plant scenario in India.
2. Diagnostic features, biomolecules and therapeutic values of some common medicinal plants.
3. Standardization of herbal drugs.
4. Conservation of medicinal plants.
5. Nutraceutical and medicinal food.
6. Preliminary idea of some common medicinal plants of India

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FOURTH SEMESTER (SEM IV)

CC-12 (PROJECT WORK): DISSERTATION / PROJECT

Topic of the Dissertation may be chosen from any area of Botany related to their special papers and may be laboratory based, field based or both or computational, with emphasis on originality of approach. It may be started during 3rd semester and shall be completed by the end of the 4th semester. It should be duly signed by the Supervisor / Research guide and the Head of the Department and submitted for evaluation. The dissertation to be submitted should include:

1. Introduction
2. Review of Literature
3. Materials and Methods
4. Results and Discussion
5. Summary and Conclusion
6. References

The examination of Dissertation will be conducted in the Department of Botany, Dr Shyama Prasad Mukherjee University, Ranchi. The distribution of marks will be as follows:

1. Describe briefly your research work with its significance. 50 Marks
2. Eminent Scientists and Scientific Journals related to your project work. 10 Marks
3. Viva – voce. 40 Marks