

COURSES OF STUDY  
M.Phil. BOTANY

(Effective from the session 2010-2011)

Department of Botany  
Ravenshaw University, Cuttack-753 003

## **M. Phil. COURSE IN BOTANY**

**Department of Botany, Ravenshaw University, Cuttack.**

(SEMESTER SYSTEM)

### **Eligibility**

Any student who has passed M.Sc. in Botany is eligible to apply.

### **Course and Regulation**

1. The course is of one year duration with two semesters for theory and a dissertation paper. The course will be credit based with 16 credits in each semester.
2. Each paper is an eight credit course with two theory papers in the first semester and one dissertation and project defence cum Viva Voce in second semester. The candidate shall have to appear end semester examination at the end of each semester.
3. The Semester system of examination will have evaluation by examiners as suggested by the Board of Studies.
4. For passing a semester examination a candidate must secure a minimum of B grade in each course paper in each semester. If the grade secured in a theory paper is F then the said mark will not be included in the aggregate.
5. If a candidate passes both the semester examination he/she will be declared to have passed the M.Phil. examination.
6. Attendance in each semester shall be strictly adhered to University Rules.
7. A candidate may repeat only once in one or more papers of any semester examination within a period of one year of the said semester examination. A candidate failing on any semester examination will be allowed to appear once only in the examination for that semester conducted for the next batch of students and also be allowed to continue to the next semester. A candidate not appearing two consecutive semester examinations will be considered to have discontinued his/her study and will not be allowed to appear the remaining semesters.
8. Merit list will be prepared as per university rules, from among the students those who have cleared all semester examinations in 1<sup>st</sup> chance in one time without repeat of any paper.
9. The candidates who have failed in one semester may be allowed to appear the same in the immediate next chance, following the due provision of the Ravenshaw University. However, he/she will not be given another chance to appear.

### SUMMARY OF THE COURSES OFFERED IN M.PHIL. (BOTANY)

<b>Paper No.</b>	<b>Course Title</b>	<b>Maximum marks</b>
	<b>1<sup>st</sup> Semester</b>	
Paper 1.1.1	CORE (CHEMICAL FOUNDATION OF BIOLOGY, INSTRUMENTATION, ANALYTICAL BIOCHEMISTRY, AND BIOSTASTICS)	<b>100</b>
Paper 1.1.2	ELECTIVE	<b>100</b>
	(A) BIOTECHNOLOGY	
	(B) INDUSTRIAL MICROBIOLOGY	
Paper 1.1.3	ANALYTICAL TECHNIQUES (PRACTICALS)	<b>100</b>
	<b>2<sup>nd</sup> Semester</b>	
Paper 1.2.1	PROJECT DISSERTATION	<b>200</b>
Paper 1.2.2	PROJECT VIVA VOCE	<b>100</b>

## FIRST SEMESTER

### Paper 1.1.1 CHEMICAL FOUNDATION OF BIOLOGY, INSTRUMENTATION, ANALYTICAL BIOCHEMISTRY AND BIOSTATISTICS

#### UNIT-I CHEMICAL FOUNDATION OF BIOLOGY

**Water:** Structure, properties and ionization; pH: Derivation of expression for pH and pOH: pKa: conjugate acid and bases, ionization of weak acids and bases; Henderson-Hasselbalch's equation, **Buffers:** Titration curves, buffer zone, mechanism of buffer action, **Principle of thermodynamics:** Heat of reaction, entropy, concept of free energy, determination of standard change in free energy; **Energy rich compounds:** Basic principles involved in energy storage in energy rich compounds with examples; **Oxidation reduction reactions:** Electron and hydrogen carriers and their flow in association with biological oxidation reduction reactions; redox potential and its role in understanding biological reactions.

#### UNIT-II INSTRUMENTATION

**Spectroscopy Techniques:** UV visible, fluorescence, NMR, Mass spectroscopy, HPLC, Intra-Red Gas Analysis (IRGL), Polymerase Chain Reaction (PCR) techniques, DNA probe and RNA probe and their labeling, immunological techniques involving proteins, ELISA, Electrophoresis: SDS-PAGE, 2-D Gel electrophoresis, Pulse Field Gel electrophoresis

#### UNIT-III ANALYTICAL BIOCHEMISTRY

**Analysis of Biomolecules:** Assay and estimation of proteins, carbohydrates (reducing and non-reducing sugars), nucleic acids, proline, Ascorbate; **Analysis of Enzymes:** Assay and estimation of peroxidase, catalase, superoxide dismutase, esterase, phosphatase, dehydrogenase, carbohydrate enzymes (Amylase, Invertase, Cellulase), protease, lipase, ATPase.

#### UNIT-IV GENOMICS, PROTEOMICS AND BIOINFORMATICS

Overview of bioinformatics, data acquisition, databases-content, structure and annotation, retrieval of biological data. Sequence analysis, building phylogenetic trees, sequence annotation; basics of structural bioinformatics, conceptual model of protein structure and introduction to protein structure prediction methods. Genomic analysis using microarray and proteomics analysis using mass spectrometry.

#### UNIT-V BIostatISTICS

Theoretical distribution (normal, binomial and Poisson distribution), Linear and non-linear correlation and regression, simple and polynomial relationship, Analysis of variance (ANOVA) (One factor and multiple factor), Duncan's multiple range test (DMRT), least significance difference (LSD) test.

## **Paper 1.1.2 ELECTIVE (A) BIOTECHNOLOGY**

### **UNIT-I PLANT BIOTECHNOLOGY-I**

Tissue culture media: types and composition, initiation and maintenance of callus and suspension cultures, somatic embryogenesis, protoplast isolation, culture and fusion, selection of hybrid cells and regeneration of hybrid plants, cybrids; anther and pollen culture for production of haploids plants and homozygous lines, micropropagation, germplasm conservation & cryopreservation.

### **UNIT-II PLANT BIOTECHNOLOGY-II**

Gene transfer methods: vector mediated gene transfer, *Agrobacterium*, tumor inducing principle and Ti plasmid, Organisation of Ti plasmid, vector less gene transfer: electroporation, particle bombardment, microinjection, chemical gene transfer method, Transgenics in crop improvement: insect resistance (bt-cotton), virus resistance, disease resistance, herbicide resistance, molecular farming.

### **UNIT-III RECOMBINANT DNA-TECHNOLOGY**

Restriction enzymes: types and their role in genetic engineering and cloning, vectors: plasmid, phages, cosmid, YAC and BAC vectors and their role in gene cloning, Cloning in bacteria and eukaryote. Molecular probe; types and uses, dot and slot: PCR technology-normal, inverse and anchored PCR techniques; isolation of genes, construction of genomic library, c-DNA library.

### **UNIT-IV FOOD BIOTECHNOLOGY & ENVIRONMENTAL BIOTECHNOLOGY**

Protein Engineering: Methods and application; Single cell proteins with special reference to *Spirulina*; Enzyme engineering: isolation, purification and immobilization of enzymes and application of such procedures; Metabolic Engineering: production of primary and secondary metabolites; Pollution control: Reduction in the effect of pesticides; eco-friendly pest and weed control; environmental and biomonitoring; Use of biotechnology in sewage treatment, Renewable energy sources; Restoration of degraded land; Biodiversity degradation

### **UNIT –V MICROBIAL PRODUCTS, BIOETHICS AND IPR**

Industrial Biotechnology: importance of microbes in industries; microbial fermentation and production of organic compounds, commercial production of antibiotics, biopesticides production; paper industry and metallurgy, Ethics of biotechnology; IPR: copyright, Trademark, patents for microbes, Plants and transgenic organism, patenting of genes, Rights of farmers.

## **Paper 1.1.2 ELECTIVE (B) INDUSTRIAL BIOTECHNOLOGY**

### **UNIT-I INDUSTRIAL MICROORGANISMS**

Scope of industrial microbiology, isolation and preservation of industrial microorganism, screening of industrially important microorganisms, strain improvement strategies, strain stability.

### **UNIT-II INDUSTRIAL FERMENTATION PROCESS**

Fermentation media: media composition, media sterilization and contamination, inoculums media, media economics, design and analysis of CSTR, measurement of bioprocess parameters, scale up fermentation, concerns and criteria, control of bioprocess parameters.

### **UNIT-III DOWN STREAM PROCESSING**

Strategies to recover and purify products, separation of insoluble products, cell disruption, separation of soluble products, purification of products, final processing.

### **UNIT-IV FERMENTATION PRODUCTS**

Microbes and industrial products, Production of primary and secondary metabolites; Antibiotic fermentation: Penicillin, Streptomycin; Anaerobic fermentation of solvents - Acetone, Butanol fermentation; Vitamins and growth stimulants: Vitamin B12, Riboflavin, Vitamin A; Enzymes as fermentation products: Amylase, Proteolytic enzymes, Pectinases.

### **UNIT -V PROBLEMS AND PROSPECTS**

Waste: Biological waste treatment, Patents and secret processes; Patent concept, Composition of a patent, subject matter and characterization of a patent, Protection of the rights of the inventor. Fermentation economics: Market potential, Fermentation and product recovery acts; Future of industrial microbiology

## **1.1.3 ANALYTICAL TECHNIQUES (PRACTICALS)**

## **SECOND SEMESTER**

1.2.1 PROJECT DISSERTATION

1.2.2 PROJECT VIVA VOCE