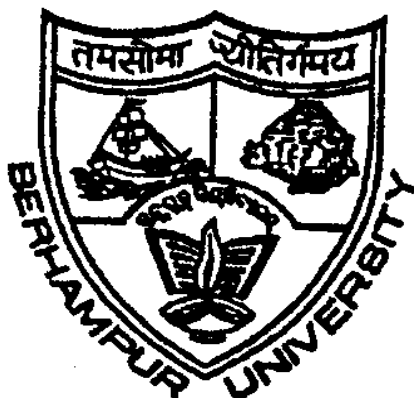


# **COURSES OF STUDIES**

**FOR**

**The M.Phil./Pre-Ph.D. in BOTANY  
(2017-2018)**



**BERHAMPUR UNIVERSITY  
BHANJA BIHAR, BERHAMPUR – 760 007  
(GANJAM) ORISSA, INDIA**

**BERHAMPUR UNIVERSITY**  
**BHANAJA BIHAR; BERHAMPUR: 760 007, ORISSA**

**COURSES OF STUDIES**

**M. Phil./Pre-Ph. D. Course Work in BOTANY, 2017-2018**

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| <b>SEMESTER-I (16 Credits)</b> |      |  |            |
|--------------------------------|------|--|------------|
| Core Course-1                  | CC-1 | Research Methodology   | 04 Credits |
| Core Course-2                  | CC-2 | Advance Plant Sciences   | 04 Credits |
| Core Course-3                  | CC-3 | Review of Literature and Seminar Presentations   | 04 Credits |
| Elective Course-1              | CE-1 | Any one optional be selected<br>(Applied Phycology/Advanced Medicinal Botany/ Pharmaceutical Microbiology and immunology/Stress Biology) | 04 credits |

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| <b>SEMESTER-I I (16 Credits)</b> |      |  |                   |
|----------------------------------|------|--|-------------------|
| Core Course-4                    | CC-4 | Seminar and Pre-Submission Presentations | 04 Credits        |
| Dissertation:                    |      |  | 12 Credits        |
| <b>Total Credit Points:</b>      |      |  | <b>32 Credits</b> |

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**SEMESTER-I**  
**CORE COURSE-1**  
**Research Methodology**  
**(04 Credits)**

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**UNIT-I**

Analytical approaches: Principles and operation of UV-Visible spectrophotometer, Atomic Absorption spectrophotometer for determination different elements in soil, water and biological samples with relevant protocols.

Community analysis: value index, diversity index and dominance index.

Dose response and determination of threshold values: EC50, non toxic and toxic doses, hormesis.

Microbial techniques: Preparation of solid and liquid media for algae, fungi and bacteria, mass culture of algae, fungi, bacteria;.

Plant Tissue culture and techniques: Media preparation, micro and macro nutrients, hormones , hardenings, Micro-propagation.

**UNIT-II**

Phase Contrast and Fluorescent Microscopy, Electron Microscopy

Centrifugation technique for separation of Biological samples

Purification and identification of biomolecules by chromatography: Paper Chromatography, Thin Layer Chromatography, Adsorption chromatography (Gel, Ion-exchange), HPLC and Gas-liquid Chromatography

**UNIT-III**

Principles of electrophoresis, SDS-PAGE, native PAGE, agarose electrophoresis, 2 - D electrophoresis, single cell gel electrophoresis, Pulse field electrophoresis, PCR technique,

**Unit -IV**

Analysis of variance (ANOVA), Chi square test, LSD test, Simple correlation and linear regression analyses.

Software for statistical analysis, data organization and presentation (Microsoft excel and SPSS).

Research paper reading, writing: Searching literature, structuring and writing a research paper (review of literature, title, introduction, material and methods, results, discussion), citing references, research and publication ethics, peer review, plagiarism.

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**CORE COURSE-2**  
**(CC-2)**  
**Advance Plant Sciences**  
**(04 Credits)**

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**UNIT-I**

Biodiversity and Plant resources: biodiversity conservation and sustainable utilization, non-conventional energy from biomass of higher plants, algae and bacteria.

Ethnobotany: Forest plant resources, traditional medicinal plant knowledge

**UNIT-II**

Concept of environmental toxicology and eco-toxicology, environmental hazards: pesticides, metals, UV and ionizing radiations, nano-materials, toxicity evaluation in plants and ecosystems, ecological impact and consequence of global climate change.

Waste management, phytoremediation of environmental pollution.

**Unit-III**

Sources of environmental stress - biotic and abiotic stress - oxidative stress, reactive oxygen species, plant adaptation to drought, salinity, temperature, and pathogen. Homeostasis. Molecular markers of plant responses to stress biotic and abiotic stress: oxidative metabolism, stress proteins, heat shock proteins, pathogen related proteins. Plant hormones (salicylic acid, jasmonic acid, abscisic acid), signal transduction and pathways

**Unit-IV**

Plant transformation: *Agrobacterium* mediated gene transfer, process of T-DNA transfer and integration, practical applications of *Agrobacterium*-mediated gene transfer, Direct gene transfer methods. Genetically modified plants: Classical mutational approaches, transgenic approaches, CRISPR-CAS technology for genome editing approaches used for herbicide tolerance, pest tolerance, disease resistance; risk and benefits associated with transgenic crops, regulations.

**CORE COURSE-3**  
**(CC-3)**  
**Seminar Presentation**  
**(04 Credits)**

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Review of Literature: meaning, significance and techniques of reviewing the literature for the specific topic/research paper.

- Developing guidelines for review of literature.
- Selecting five research papers on any topic of Botany/Bioscience and reviewing all.
- Preparing a report on the reviewed papers- at least 05 research papers.
- Presenting the research reviewed papers through PPT.

**Evaluation:**

The candidate has to present his/her paper through PPT before the Department RAC and submit a report after the presentation. The department RAC will evaluate each report and overall grade secured by the candidate will be done based on the presentation and report.

**ELECTIVE COURSES**  
**Related to Research**

(CE-1)

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**APPLIED PHYCOLOGY**

**UNIT-I**

Algae in diversified habitats (terrestrial, freshwater, and marine). Distribution of economically important algae in India.

Sampling techniques of phytoplankton, assessment of primary production of water. Identification of some important micro algae like, *Chlorella*, *Scenedesmus*, *Tetraselmis*, *Dunaliella*, *Ceratium*, *Peridinium*, *Cyclotella* and *Skeletonema*

Identification of some macro-algae like *Ulva*, *Enteromorpha*, *Codium*, *Caulerpa*, *Ectocarpus*, *Padina*, *Sargassum*, *Porphyra*, *Gelidium*, *Eucheuma*, *Hypnea*, *Gracilaria*

**UNIT-II**

Mass culture techniques for yield of biomass of micro algae (*Chlorella*, *Scenedesmus*, *Spirulina*) and their commercial utility for food and feed, pigments, pharmaceuticals and nutraceuticals, fine chemicals, biofuel and biofertilizers,

**UNIT-III**

Seaweed farming in India, with emphasis on the methods of seaweed cultivation of *Sargassum*, *Porphyra*, *Gelidiella*, *Gracilaria*.

Methods of extraction of Agar-agar and Algin, Seaweeds liquid biofertilizers (SLF).

**UNIT-IV**

Algae and water pollution; Algae as indicators of pollution, algal bloom and control Biofouling, Phycoremediation, use of algae for sewage treatment.

**ELECTIVE COURSE  
(CE-1)**

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**PHARMACEUTICAL MICROBIOLOGY AND IMMUNOLOGY**

**UNIT I**

**Bacterial pathogenesis:** Rapid Detection of Food borne Pathogenic Bacteria  
Pathophysiology of Infectious diseases – diseases of respiratory tract, urinary tract, digestive system, skin and soft tissues.

**UNIT II**

**Antibiotics:** Antibiotics and synthetic antimicrobial agents (Aminoglycosides,  $\beta$  lactams, tetracyclines, cephalosporins, flouoroquinolones, macrolid antibiotics)  
Antifungal antibiotics. Mechanism of action of antibiotics (inhibitors of cell wall synthesis, nucleic acid and protein synthesis).

**UNIT III**

**Natural therapeutics:** Isolation, purification and characterization of secondary metabolites from plant, Mechanism of action of natural antimicrobial agents (inhibitors of cell wall synthesis, nucleic acid and protein synthesis)

**UNIT IV**

**Immune system:** Antigen, antibody reaction, expression and regulation of immune response, immunity and immunoassays.

**ELECTIVE COURSE  
(CE-1)  
ADVANCE MEDICINAL BOTANY**

**UNIT-I**

**Floristic Survey:** Field collections and preservations of specimens in herbarium; phytography, identification and formulation of diagnostic keys; documentation of data; analysis of flora; flora of Odisha; its past present and future; flora of India.

**UNIT-II**

**Herbarium Management:** Concept and definition; historical development; role of herbarium; famous herbaria of the world; present state of herbarium; changing nature of herbarium and its future; arrangement of specimens in the herbarium; operation and maintenance.

**UNIT-III**

**Plant Nomenclature:** Historical development and critical evolution of various facets of International Code of Botanical Nomenclature; typification and guide for the determination of types; priority and limitations of the principle of priority; retention, choice and rejection of names and epithets; concept of epithets.

**UNIT-IV**

**Structural Studies of Macromolecules and micro-molecuales:** Macro molecules (Starch, polypeptides, proteins, Enzymes and Nucleic acid) and micro molecules (phenols, flavonoids, steroids, wax). Antioxidant.



## **SEMESTER-II**

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### **Core Course-4**

**(CC-4)**

**Review of Research Progress:  
Seminar and Pre-Submission Presentations  
(04 Credits)**

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This paper includes four (04) presentations based on the M. Phil. dissertation carrying one credit points per presentation and report to be done every month (From 2<sup>nd</sup> month onwards) during the period.

**Unit-I:** Presentation of research proposal

**Unit-II:** Presentation on Review of Literature on the proposed topic

**Unit-III:** Presentation on Methodology and plan of research

**Unit-IV:** Final/Pre-Submission presentation

**Evaluation:**

The candidate has to present his/her paper through PPT before the Department RAC and submit a report after the presentation. The department RAC will evaluate each report and overall grade secured by the candidate will be done based on the presentation and report

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## **DISSERTATIONS**

**(12 Credits)**

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