

**Syllabus for Ph.D. Coursework
in Microbiology**



(w.e.f. the session 2020-21)

**POST GRADUATE DEPARTMENT OF BOTANY
UTKAL UNIVERSITY
BHUBANESWAR-751004**

Ph.D. COURSEWORK in MICROBIOLOGY

P.G. Department of Botany, Utkal University, Vani Vihar, Bhubaneswar

To be effective from the session 2020-2021

Eligibility

Any student who has passed Master degree in Microbiology/Applied Microbiology/ Life Science/ Botany/ Zoology/ Biotechnology/Medicine/ Dental Science/ Pharmacy/ Agricultural Science/ Fishery/ Veterinary science/ allied biological sciences and having minimum of 50% marks in Masters Level.

Admission

The candidates are to take admission after qualifying in an entrance test as per university guidelines. The merit list will be prepared after recommendation of SRC. The admission will be strictly as per the merit list in each category as per university norms.

Course and Regulation

- 1.** The course is of six months duration with one semester for two theory paper, one review paper presentation and one seminar presentation.
- 2.** Each paper carries 100 marks and six credit points.
- 3.** The semester system of examination will have internal system of evaluation as suggested and approved by Teacher's council.
- 4.** In order to pass a semester examination a candidate must have to secure a minimum of 60% marks in aggregate and a minimum 50% mark is essential to pass in each paper.
- 5.** Attendance in the semester shall be strictly adhered to University

Rules.

Details of the Syllabus:

Paper	Title	Marks allotted	Credit
I.	Research Methodology	100	06
H.	Core Paper-Microbiology	100	06
III.	Review Paper Presentation	100	06
IV.	Seminar Presentation	100	06
	Total	400	24

Detailed syllabus for Paper -I

Research Methodology

P. G. Dept. of Botany, Utkal University

Credits: 06 FM: 100

Course Objective

- To get introduced to the fields of various instruments used in microbiology including the basic principle - application and working.
- To get idea on basic computational analysis and its applications
- The course is designed to train the students in statistics, bioinstrumentation, molecular tools and techniques essential for the understanding of life sciences and microbiology.

Unit I

General Analytical Techniques: Concept of pH and buffer, Chromatography: techniques & application, Electrophoresis: techniques & principle, microscopy. *Spectroscopic Techniques:* UV-Visible spectrophotometry, Atomic absorption spectrophotometry, Plant Efficiency Analyser.

Unit II

Statistical Methods: Measures of Central tendency of data, t- and x²-test, F-test, correlation and regression analysis.

Unit III

Computer Application: MS office, Internetworking concept, bioinformatics application, Fundamental of Remote Sensing and Geographical Information System (GIS) and its application in various areas.

Unit IV

Review and Research article: Differences between review and original research article, types of review articles, writing research article and thesis, reference/bibliography formats.

Unit V

Research ethics: Philosophy and ethics, scientific conduct; publication ethics; open access; publishing, publication misconduct, databases & research metrics.

Course outcome:

On completion of the course,

- The students will develop the capability to carry out experiments involving several instrumentation applications.
- The student will be aware with a basic knowledge of modern molecular biology and genomics
- The students will learn to approach a research problem logically and will be able to do statistical analyses in research.
- To help students to have an idea on basic mathematical problems and calculations needed in microbiological aspects.
- The course aware about research ethics in dealing with the microbiological research.

Detailed syllabus Paper-II

Core Paper- MICROBIOLOGY P.G. Dept. of Botany, Utkal University

Credits: 06 FM: 100

Course Objectives

- To give an introduction to the various aspects of environmental biotechnology and Food and Dairy biotechnology to the students.
- To explain the industrial aspects of microbiology for the production of various of industrial products of biological origin.
- The course explains the application of microorganisms in environment and the role of microorganisms in industrial, food and dairy technology.
- To get introduced to the industrial applications of microbes and application of microbes in recombinant DNA technology.
- The course is designed to train the students in optimization of microbial products and pathways for synthesis of secondary metabolites.
- This will also train students to design various culture systems for the growth of microorganisms for obtaining desired industrial products and use of microbes as vectors for several recombinant DNA techniques.

Unit I

Basic techniques: Methods for isolation, purification, preservation of microbes, Sterilization techniques, Media preparation, staining techniques for bacteria & fungi, Generation time and growth curve, Synchronous and diauxic growth of microbes, factors affecting growth of microbes.

Unit II

Microbes for food and industrial exploitation: Principle of food preservation, Contamination and spoilage of food products: cereals, fruits, vegetables, meat, fish, milk, sea foods. Industrial production of ethyl alcohol, antibiotics, enzymes.

Unit III

Fermentation and Optimization of microbial products: Bioreactors: Modes of operations, design and types of bioreactors, Downstream processing: product separation, concentration, purification and finishing of products, Optimization of microbial products: Parameters in scaling-up, macro and micro nutrients, pH & temperature.

Unit IV

Environmental microbiology: Microbial ecology: microbes in air, water and soil, microbial standard, biomagnifications and bioremediation, Microbes in waste management, biogas and ethanol production.

Unit V

Genetic engineering: Cloning vectors and construction and transport of recombinant DNA into bacteria, selection and identification of recombinant clones, Ti and Ri plasmids of *Agrobacterium*, mechanism of T-DNA transfer to plants.

Course outcome

At the end of this course,

- The students get trained in basic aspects of microbiology.
- Obtain knowledge on basic principles and technologies of decontamination of persistent organic pollutants (dangerous contaminants of the environment) mainly by means of the biological approaches i.e. using bioremediation etc.
- The students will know about the principles and techniques underpinning the application of biosciences to the environment.
- Gets a detailed insight into the industrial processes carrying out in the food and dairy sector and fermentation technology.
- The students will develop the capability to carry out experiments and future research involving several recombinant DNA techniques.
- It will help students to have an idea on genetic engineering of microbes for plant improvement.

Paper-III: Review paper Presentation

Credits: 06 FM: 100

The candidate has to present a complete review paper pertaining to his/her probable research topic and also to submit a hardcopy of the same not exceeding 2000 words.

Paper-IV: Seminar Presentation

Credits: 06 FM: 100

The candidate has to present a paper pertaining to his/her topic of interest in the relevant subject and also to submit a hardcopy of the same not exceeding 1000 words.