Syllabus

For

Ph.D. Coursework (Biotechnology)

Session: 2020-2021

P.G. Department of Biotechnology
Utkal University
Bhubaneswar, Odisha

Outline of Ph.D. Coursework Curriculum
P.G. Department of Biotechnology
Utkal University

Semester-I

Sl No	Paper	Subject	Marks
1	I	Research Methodology/ Tools and Techniques in Biotechnology	100
2	II	Biostatistics and Computational Biology	100
3	III	1. Review of Literature : 50 marks 2. Presentation before SRC : 50 marks	100
4	IV	1. Seminar-I: 50 marks 2. Seminar-II: 50 marks	100
Total			400

Ph.D. coursework Syllabus
(Biotechnology)

Paper-I   **Marks: 100**

UNIT –I (RESEARCH METHODOLOGY)
1. Research objective and statement of problem, types of research.
2. Research proposal designing and formulation.
3. Research Methodology.
4. Review of literature, concept development, theory, hypothesis and manuscript preparation.

UNITS-II (INSTRUMENTATIONS)
1. Principles and applications of spectrophotometer.
2. Principles and applications of Chromatography. Types of Chromatography.
3. Principles and applications of Electrophoresis.
4. Principles and applications of PCR.

UNIT – III (TECHNIQUES IN BIOTECHNOLOGY)
1. Isolation and purification of DNA.
2. Isolation and purification of RNA.
3. Isolation and Purification of Proteins.
4. Commonly used vectors for gene-cloning, DNA manipulating enzymes, construction of genomic and cDNA libraries.

UNIT – IV (MICROBIOLOGY)
1. Methods in Microbiology: Sterilization, Culture Media, Pure culture technique, enrichment culture technique, Microbial staining methods, Maintenance and preservation of Microorganisms.
2. Microbial growth: Growth curve, measurement of growth, growth yields, synchronous growth, continuous culture, growth as affected by environmental factors.
3. Antibiotics: Penicillin and Cephalosporin, broad-spectrum antibiotics, antibiotics from prokaryotes, antifungal antibiotics, mode of action of different antibiotics, resistance to antibiotics, Multiple Drug Resistance.
4. Microbes for industrial use. Fermentation and fermented products, Bio-fertilizers, Microbes in mineral beneficiation and bioremediation.

UNIT-V (IMMUNO-TECHNOLOGY)
1. Antigen antibody interaction and their applications in immunodiagnostics.
2. Detection of antigen /protein by western blotting.
3. Antigen based biosensor, ELISA and CHIP.
4. FACS and its applications.

BIOSTATISTICS AND COMPUTATIONAL BIOLOGY

UNIT - I

1. Statistics: Definition, functions and limitations.
2. Treatment of data: frequency distribution, Graph of Frequency Distribution
3. Descriptive Measures: Averages and Dispersions (Grouped and ungrouped).
4. Probability: Concepts, definition and elementary problems based on definition.

UNIT - II

1. Inference: Definition-parameter, Statistic sampling distributors, standard error,
2. Test of Hypothesis, type I and Type II errors.
3. Large sample tests**:** Z tests, small sample tests**:** t and F tests.
4. Chi-square test: Goodness of fit and Test of independence.

UNIT - III

1. Curve Fitting: First, Second degree and exponential curve.
2. Simple correlation and Regression.
3. Concept of multiple correction and Regression.
4. Analysis of variance: one way and two way classification.

UNIT – IV

1. Fundamentals of Computer: CPU, memory, I/O unit, storage, multimedia. Introduction to Operating Systems: DOS, Windows and Linux Operating Systems. Ideas about Computer Viruses. Use of online resources and the internet communication technology.
2. Idea on working with MS-Word, Excel and Power point.
3. Programming with C++ and PERL: Introduction, Control Flow: Statement and Block, if, if-else, Nested if-else statements, For, while, do-while loops, break, switch continue, Statements, go to statement. Functions and Arrays.
4. Computation of simple mathematical and statistical formulae using the Programming C++ and PERL.

UNIT - V

1. Introduction to Bioinformatics
2. Elementary idea about Database management system, e.g. Gene bank, EMBL, Swiss-Prot, Sequence database like FASTA, BLAST algorithm and Bioinformatics tools.
3. Pairwise sequence alignment, multiple sequence alignment, Gene prediction and Protein structure prediction.

Paper-III   **Marks: 100**

    3.   Review of Literature :   50 marks
    4.   Presentation before SRC :   50 marks

Paper-IV   **Marks: 100**

    3.   Seminar-I: 50 marks
    4.   Seminar-II: 50 marks