

CENTRAL UNIVERSITY OF SOUTH BIHAR



Ph.D. in Biotechnology Syllabus

(Effective from Academic Session 2019-2020)

**Department of Biotechnology
SCHOOL OF EARTH, BIOLOGICAL AND
ENVIRONMENTAL SCIENCES**

Department of Biotechnology**Ph.D. Syllabus**

There will be 12 credit courses (two semesters) for a Ph.D. student.

Semester I and II

Course Code	Courses	Credits
BTN 901	Fundamentals of Research Methodology	4
BTN 902	Scope and Techniques of Research in Biological Sciences	4
BTN 903	Preparation and Presentation of Research Proposal	4
Total Credits		12

BTN 901- Fundamentals of Research Methodology (4 Credits)

Course objectives: This course is designed to provide an overview on fundamentals of doing research including scientific terminology, literature, methods, analysis and interpretation of data, preparation of research report and presentation, future aspects of research as a career, importance and applications of scientific research to the society. It will help the students to develop core research skills relevant to a wide spectrum of biological research, including written and oral communication, skills in making scientific observations, and recording and analysing data by participating in discussions or through presentations or group research project associated with a discipline of interest to them.

Unit 1: Perspectives of Scientific Research

Science and Technology, Meaning and Characteristic of Research, Importance and Types of Research Activities, Principles of Quality Research Work, Problems Encountered in Research, Scientific Attitude and Temper, Qualities of Good Researcher, Contribution of Indian Scientists in Global Research

Unit 2: Getting started with Research

Planning and Designing of Research, Criteria and Validity of Good Research, Reliability in Research, Artefacts and Bias, Managerialism and Scientific Research, Leadership in Scientific Research

Unit 3: Scientific Methodology and Biosatistics

Introduction to biostatistics, concept of variables in biological systems. Data representation and summary measures for central tendency, dispersion, skewness and kurtosis of a

frequency distribution. Classical, frequency and axiomatic approach of calculating probability, conditional probability and Bayes theorem. probability distribution: binomial and normal distribution.

Concepts of population and sample. Making inference about population from sample, framing hypothesis and possible errors. Testing hypothesis about mean: one sample and two sample cases. ANOVA and regression analysis.

Unit 4: Research in Practice and Scientific Writing and Scientific Presentation

Literature Review, Journals, Conference Proceedings, Journal Impact Factor, Citation Index, Research index, Reading a Scientific Paper, Seminar, Conference and Workshops, Scientific Paper, Writing a Scientific Paper, Communicating to a Journal, Writing a Grant for Funding, Preparation of Research Presentation, Presenting in PowerPoint, Open Presentation

Unit 5: Ethics in Research

Research Ethics, Importance of Ethics in Research, Ethics: Values and Principles, Some Ethical Issues, Codes of Ethics, Costs of Research Misconduct, Dealing with Research Misconduct, Research Ethics Committees, General Ethics and Ethical issues,

Books:

- C R Kothari, Research Methodology: Methods and Techniques.
- Khanal Arun , BhadraMahajan'S Methods In Biostatistics For Medical Students And Research Workers
- Ronald B. Corley,A Guide To Methods In The Biomedical Sciences

BTN 902 - Scope and Techniques of Research in Biological Sciences (4 Credits)

Course objectives: This course is designed to teach basic concept, principle and application of various instruments/tools commonly used to conduct experiments in biotechnology, life science and bioinformatics. This course includes familiarization with general techniques, methods of data analysis and interpretation. This course consists of teachings like good laboratory procedure and practices, standard operating procedures for biological research, legal and institutional framework for biosafety, international agreements and protocols for biosafety.

Unit 1: Fundamental Techniques

Compound, Phase-contrast, Confocal and Electron Microscopy, Gel Electrophoresis: DNA, RNA and Protein separation, ELISA, Chromatography: Gel Permeation, Ion-Exchange, and Affinity Chromatography, UV/VIS Spectrophotometry, Fluorescent Spectroscopy, Mass Spectroscopy, HPLC, Flow Cytometry, Electrophoretic Mobility Shift Assay (EMSA) and GST Pull Down Assay, Sequence Analysis through BLAST, Primer Designing.

Unit 2: Techniques Related to Plant and Animal Biotechnology

Plant Tissue culture, Transgenic and Molecular Marker Development For Crop Improvement, Animal Tissue Culture, Transgenic Animal, Animal and Human Cloning, Transgenic Techniques and Relevance

Unit 3: Biosafety and IPR

Definitions and Biosafety levels, Containment Facilities and Biosafety Practices, General Guidelines for rDNA Research and GMO, Structure and Functions of Committees, Good Lab Practices, Patents, Copyrights and Trademarks

Unit 4: Microbial Growth and Analysis

Microbial Growth and Products Formation, Media Formulation for Fermentation, Media Optimization and Sterilization, Mass Balance in Biotechnology, Types and Modes of Cultivation (Batch, Fed Batch And Continuous Bioreactions), Different Types of Bioreactors- CSTR, Airlift Bioreactor, Packed Bed, Fluidized, Photobioreactors, Enzyme Reactors

Suggested Readings:

1. Nuclear Magnetic Resonance: Williams
2. Biochemical Techniques theory and practice: White R
3. Analytical Chemistry: Christion G. D.
4. A Biologist Guide to Principle and Techniques: Willson K. and Gounding K.H.
5. An Introduction to Practical Biochemistry: Plummer D. T.
6. Bioethics And Biosafety by M. K. Sateesh (2008)
7. Biosafety Regulations of Asia-Pacific Countries by Kavita Gupta, J. L. Karihaloo and R. K. Ketarpal (2008)

BTN 903 - Preparation and Presentation of Research Proposal (4 Credits)

Course objectives: This course is designed to prepare the students for the research topic that he/she will take for Ph.D degree. This course consists of review of literature, presentation and finalizing the proposed area of research. The course is divided into three parts.

Review of Literature and Presentation in DC

Identifying the Gap Area of Research and Presentation in DC

Submission of Proposed Area of Research to DRDC and Presentation in DRDC