



**CENTRAL UNIVERSITY OF SOUTH BIHAR**  
**School of Earth, Biological and Environmental Sciences**

**Department of Life Science**

**Ph.D Syllabus**

**Course Structure of PhD in Life Science (PhD. in Life Science)**

**Total Credits: 12 Cr.**

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

**Semester I**

<b>Course Code</b>	<b>Courses</b>	<b>Credits</b>
LSC 901	Fundamentals of Research Methodology	04
LSC 902	Scope and Techniques of Research in Biological Sciences	04

**Semester II**

LSC 903	Preparation and Presentation of Research Proposal	04
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*G. Prasad*  
19/02/19

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19/02/2019

*by*  
15/2/19

*Prasad*  
19/02/19

*P.P. Sathya*  
19/2/19

# Semester I

## LSC 901: Fundamentals of Research Methodology (04 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**

Rules and Principles of Scientific Method, Hypothesis and Testing a Hypothesis, Data Collection and Analysis/Sampling Theory, Interpretation of Results and Generalization, Descriptive Statistics, Random Variable, Distribution of Random Variables, Binomial and Normal Distribution, Non Parametric Tests, Correlation And Regression, Linear Programming, Student's t' test, Chi square test, Fisher test and Z- test. Analysis of variance: One way & two ways ANOVA.

### **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**

Ethical, legal, social and scientific issues in biological 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 , Bhadra Mahajan'S Methods In Biostatistics For Medical Students And Research Workers
- Ronald B. Corley,A Guide To Methods In The Biomedical Sciences

### **LSC 902: Scope and Techniques of Research in Biological Sciences (04 Credits)**

**Course objectives:** This course is designed to teach basic concept, principle and application of various instruments/tools commonly used to conduct experiments in biological sciences. 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**

Analysis of Biological samples using microscopic techniques. Visualization of cells and subcellular components – Light, Fluorescent and Electron microscopy. Living cells- Phase contrast and confocal microscopy. FISH & GISH. Gel Electrophoresis: DNA, RNA and Protein separation, ELISA, Chromatography: Principle and types of column and planar liquid chromatography; Gas chromatography, and Affinity Chromatography, Analysis of biomolecules using spectrometric analysis: UV/VIS Spectrophotometry, Fluorescent Spectroscopy, Mass Spectroscopy, IR&FTIR, HPLC, Flow Cytometry, Electrophoretic Mobility Shift Assay (EMSA) and GST Pull Down Assay.

#### **Unit 2: Techniques Related to Plant and Animal Tissue Culture**

Plant Tissue culture, Transgenic and Molecular Marker Development for Crop Improvement, Animal Tissue Culture, Transgenic Animal, Animal and Human Cloning, Transgenic Techniques and Relevance, In vitro bioassay methods and their principle

#### **Unit 3: Biosafety and IPR**

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

#### **Unit 4: Bioinformatics**

Introduction to Bioinformatics, Biological Databases (NCBI, EBI, JDBD) - GenBank, SwissProt, PDB, KEGG, Sequence Analysis: BLAST and its Types, Multiple Sequence Alignment local & Global, Methods for Phylogenetic Analysis, Microarray Data Analysis: Methods, Tools and Resources, Protein Structure Prediction and Visualization, Bioinformatics in Drug discovery, Programming Languages in Biological Data Analysis.

#### **Suggested Readings:**

1. Nuclear Magnetic Resonance: Williams
2. Biochemical Techniques theory and practice: White R
3. Analytical Chemistry: Christian 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.

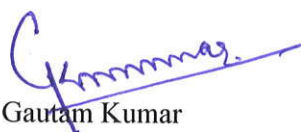
6. Bioethics And Biosafety by M. K. Sateesh (2008)
7. Biosafety Regulations of Asia-Pacific Countries by Kavita Gupta, J. L. Karihaloo and R. K. Ketarpal (2008)
8. Mount DW (2001) Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press
9. Sharma V, Munjal A, Shanker A (2016) A Text Book of Bioinformatics. Rastogi Publications
10. Principles and Techniques of practical Biochemistry by K Wilson and K Walker ,Cambridge
11. Biochemical calculations by Irwin H Segel, John Wiley & Sons Publishers
12. Bioinformatics Sequence and Genome Analysis by David W Mount
13. Essential Bioinformatics by Jin Xiong; Cambridge Publishers
14. Bioinformatics Sequence and Genome Analysis by David W Mount, CSHL press
15. Essential Bioinformatics by Jin Xiong; Cambridge

## Semester II

### LSC 903: Preparation and Presentation of Research Proposal (4 Credits)


**Course objectives:** This course is designed to prepare 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
- The course work, including research methodology courses shall be finalized after a combined assessment by the Research Advisory Committee and the DRDC/CRDC

  
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