

COURSES OFFERED FOR Ph.D. CURRICULUM

July 2017 onwards



**Department of Biochemistry
Faculty of Interdisciplinary and Applied Sciences
University of Delhi South Campus
Benito Juarez Road
New Delhi-110021**

Passed in DRC held on 6th September, 2017

The courses offered for the Ph.D. curriculum aim to provide the students with excellent knowledge in various Tools, Techniques and Research methodologies in Biochemistry emphasizing on solid background of basic concepts as well as rapid advancement in the field, providing them an initiation into their respective research fields. The department will offer the following two papers for Ph.D. course work:

Paper I (BIOCHEM P-I): RESEARCH METHODOLOGY

Paper II (BIOCHEM P-II): TOOLS AND TECHNIQUES IN BIOCHEMISTRY

These courses are also open for Ph.D. students from other departments in FIAS. The Ph.D. students of the biochemistry department are also free to choose from Ph.D. courses offered by the other departments. A student has to pass both the papers in one academic year (two semesters) to successfully complete the Ph.D. course work.

Evaluation: All the papers will have components of continuous evaluation and end semester examination. The total marks for each paper will be 100. A student has to score 50 marks to pass a paper. The distribution of marks will be as follows:

Paper	Continuous evaluation	End-semester evaluation	Total Marks
BIOCHEM P-I	50	50	100
BIOCHEM P-II	30	70	100

Both the courses will be offered in the July to December semester.

RESEARCH METHODOLOGY (BIOCHEM P-I)

CREDITS- 4

Total Hours: 64

Unit 1. Biosafety and Bioethics in Research*

No. of Hours: 8

Guidelines for Biosafety and Bioethics; Safety practices and Bio-waste in the laboratory; Radioactivity and safety; Fire hazards and safety; Institutional Biosafety, Ethics and Animal Ethics compliance and concerns; Genetically modified organisms; Patents and Intellectual property rights; Plagiarism; Reproduction of published material, Citation and acknowledgement; Guidelines for Ph.D. thesis.

Unit 2. Defining the Research Problem

No. of Hours: 34

Identification of broad area of research; Review of literature using appropriate sources – reviews, patents, research papers, books; Utilization of tools for literature source – web and libraries; Defining a research problem

Unit 3. Experimental Approaches and Methodology

No. of Hours: 12

Experimental designs to address the research problem; Alternative plans for experimental design; Tools and techniques to execute experiments; Means to validate and analyze data; Methods of record keeping.

Unit 4. The art of Presentation

No. of Hours: 10

Development of writing skills – Plan of research, Research project, Research report, Research article and review, Term paper; Bibliography, referencing and footnotes; Creation of reference libraries; Plagiarism check; Development of Oral presentation skills – Planning, Preparation, Practice, Oration; Use of visual aids and software like MS Word, MS PowerPoint, MS Excel, EndNote.

Students are expected to undertake the following assignments, exercises and evaluations.

1. Identify the broad area of research in consultation with Ph.D. supervisor.
2. Review literature, collate information, identify scope of research, formulate a research plan and prepare and submit a term paper including references.
3. Present and defend their research plan orally.
4. Evaluation will be based on term paper and oral presentation.

* Students are also encouraged to attend 1-2 days workshops / seminars / lectures on IPR / Bioethics / Biosafety. This can count towards the hours assigned for the module.

SUGGESTED READINGS

1. Research Methodology - Methods and Techniques (2004) 2nd ed., Kothari C.R., New Age International Publishers.
2. Research Methodology: A Step-by-Step Guide for Beginners (2005) 2nd ed., Kumar R., Pearson Education.

TOOLS AND TECHNIQUES IN BIOCHEMISTRY (BIOCHEM II)

CREDITS- 4

Total Hours: 64

Unit 1. Genomics

No. of Hours: 11

Global expression profiling; Whole genome analysis of mRNA and protein expression; Real time PCR to monitor changes in expression levels; Concept of microarrays and its applications for DNA, RNA and proteins.

Unit 2. Spectroscopy and Spectrometry

No. of Hours: 11

General principles of spectroscopy and spectrometry, theory and applications of various spectroscopic techniques; Mass spectrometry and its biological applications.

Unit 3. Recombinant DNA Technology

No. of Hours: 10

Use of Restriction and modification enzymes in cloning, Plasmid/Phagemid vector, Ligation, Transformation and Plasmid isolation, Oligonucleotide synthesis and purification, Amplification of DNA using PCR; Design of primers; Applications of PCR in research, Basic DNA sequencing methods, Sanger's chain termination method, and automated DNA sequencing, Introduction to next generation sequencing (NGS).

Unit 4. Growth, Maintenance and Genetic engineering of Mammalian cells

No. of Hours: 11

Basic requirements for in vitro cell culture, live cell staining and counting, and synchronization of mammalian cells. Application of FACS for detection of apoptotic cells and cell cycle phases. Various ways of overexpressing and silencing genes in mammalian cells; Generation of transient and stable lines. Use of radioisotopes in cell biology.

Unit 5. Cell Fractionation and Cell Interaction Methods

No. of Hours: 10

Cell fractionation; Centrifugation; Isolation and purification of membrane proteins and lipids; Various methods to study cell-cell and cell-virus fusion, Electrophoresis.

Unit 6. Purification and Characterization of proteins and Drug discovery

No. of Hours: 11

Expression vectors; Expression, isolation and purification of heterologous proteins; Chromatography techniques for protein purification; Mapping of protein interactions: two hybrid, Protein fragment complementation, Concepts of drug discovery and development.

SUGGESTED READINGS

1. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.
2. Molecular Cloning: A laboratory Manual (2012) Vol. 1-3, 4th ed., Green M.R. and Sambrook J., Cold Spring Harbour Laboratory Press (New York). ISBN: 978-1-936113-41-5 / ISBN: 978-1-936113-42-2.
3. Animal Cell Culture & Technology (2004) 1st ed., Butler, M., Taylor & Francis Publishers (UK), ISBN-1: 859960499.
4. Principles and Techniques of Biochemistry and Molecular Biology (2010) 7thed, Keith Wilson and John Walker, Cambridge University Press India Pvt. Ltd., ISBN-13: 978-0-521-17874-7 / ISBN:10: 0-07-099487-0.
5. R. Burgess, M. P. Deutcher. 2009. Guide to Protein Purification, Academic Press, San Diego, USA.