



**FACULTY COUNCIL OF SCIENCE
JADAVPUR UNIVERSITY**

NOTICE

It is to notify for information of all concerned that the classes of Ph.D. Course Work for the year 2019 under the **Department of Life Science & Biotechnology** will be held on every Thursday and Friday commencing from Thursday, the 25th of July 2019 in the respective department. All registered candidates who are willing to do Ph.D. course work under the said Department are requested to submit Ph.D. Course registration form duly forwarded by the concerned Supervisor(s) and HoD of the respective Department to the Office of the undersigned within Tuesday, the 23rd of July 2019.

The course work registration form and the modules of course work are annexed in the consecutive pages.

Date: 08/07/2019

Sd/-

**(Dr. Atiskumar Chattopadhyay)
Principal Secretary,
Faculty Council of Science**



যাদবপুর বিশ্ববিদ্যালয়

JADAVPUR UNIVERSITY
KOLKATA-700 032

FORM FOR COURSE REGISTRATION FOR PH.D.SCHOLARS
(UNDER F.E.T./F.SC./F.A.)

DEPARTMENT/SCHOOL/INSTITUTION : **LIFE SC. & BIOTECHNOLOGY**
(in which registered for Ph.D.)

(ENROLMENT FOR SEMESTER: JULY/DECEMBER, JANUARY/JUNE)

1. Name in full (in Block letters) : _____
2. Sex(Male/Female) : _____
3. Address for Communication: _____

4. Phone No. _____ Mobile No. _____
5. Course Taken:

Sl.No.	Name of Subject/course	Subject Code	Dept./School/Institution under which subject offered
1.	Research Methodology	A	
2.	Review of Research Work	B	
3.			
4.			
5.			
6.			

Date: _____

Signature of the student in full

Head of the Department/Director of School

Supervisor(s)

Signature of the Dean, Faculty of Science

Registration No. _____ of _____

Date of Registration _____

Superintendent, Ph.D. Cell, Faculty of Science

SYLLABUS OF COURSE WORK OF PH.D(Sc.)

DEPARTMENT OF LIFE SC. & BIOTECHNOLOGY

Courses	Subject	Full Marks
Compulsory Units	A. Research Methodology	50
	B. Review of Research Work	50
Elective Units	1. Cell culture techniques	20
	2. Microbiology	20
	3. Introduction to Molecular Biology Techniques – Applications in Biotechnology. <ul style="list-style-type: none">❖ Introduction – Principles of Molecular Biology Techniques❖ DNA Molecular Technique❖ Southern Blotting❖ Northern Blotting❖ Polymerase Chain Reaction(PCR)❖ DNA sequencing❖ DNA Library Construction❖ Microarrays	60

N.B. See the successive pages for the syllabus in detail.

COMPULSORY UNITS

A. Research Methodology:

Definition of problem : Necessity of defining problem, Technique involved in defining a problem. Surveying the available literature.

Techniques involved in solving the problem: Different methods used to solve a problem.

Research Design: Subject of study; Place of study; Reason of such study; Type of data required; Method of data collection; Periods of study; Style of data presentation.

Developing a research plan: Research objective; Informations required for solving the problem; Each major concept should be defined in operational terms; An overall description of the approach should be given and assumption if considered should be clearly mentioned in research plan; The details of techniques to be adopted.

Methods of data collection: Experimental methods.

Analysis of data: Various measures of relationship often used in research studies, Correlation coefficients.

Chi-Square test: Definition of chi-square test. Significance in Statistical analysis.

Computer:

Basic of Computer Operating System: Using Windows – Directory structures – command structure (Document preparation, EXCEL, Power Point Presentation).

Word Processing: Basics of Editing and Word processing.

Numerical analysis.

Figure Plotting: Figure insertions in documents.

Web Browsing for Research: Usage of Webs as a tool for scientific literature survey.

Error Analysis: Basics of a measurement and its interpretation, mean, standard deviation, variance, correlation coefficient; Usage of packages (e.g. ORIGIN; EXCEL) for data analysis.

Curve Fitting: Linear and Non-linear fitting of data.

B. **Review of Research Work:**

The relevance of the research work from the perspective of the subject – Possible ways to apply the research work in future.

ELECTIVE UNITS

Unit 1: Cell culture techniques

No. of Classes: 10

Introduction to course and lab safety, Brief review of basic lab techniques, Review / Introduction of microscope use: Light and fluorescence microscope, Cell culture: Introduction to sterile cell culture technique. Counting viable cells and subculture into multiwell plates. Cell counting using hemocytometers. Cell attachment (adhesion) and growth. Cell attachment (adhesion) and growth. Cell staining techniques: Culturing of primary cells, preparation of human chromosome, Application of primary cell culture techniques. Isolation of chromosomal DNA, Preparation of cellular extract, isolation of nuclear extract and cytoplasmic extract.

Unit 2: Microbiology

No. of Classes: 10

The world of microbiology and development of microbiology as a scientific discipline, Methods of studying microbes: Introduction to various types of microbes, Growth of bacteria; Control of Microbes; Isolation, identification and characterization of bacteria Prokaryotic cell structure and function.

Unit3: Introduction to Molecular Biology Techniques–Application in Biotechnology

No. of Classes: 40

❖ **Introduction – Principles of Molecular Biology Techniques**

Introduction to basic and advanced information on DNA, RNA and proteins. Potential applications of molecular biology techniques in drug discovery and development will also reviewed.

❖ **DNA Molecular Technique**

Isolation and purification of DNA samples from different cell types and tissues, DNA concentration techniques, restriction digestion and analysis, ligation of DNA to create recombinant molecules and “designer genes.”

❖ **Southern Blotting**

Agarose gel electrophoresis, DNA transfer techniques, isotopic and non-isotopic probe labeling methods, hybridization, x-film exposure, interpretation of results.

❖ **Northern Blotting**

Blotting of isolated and purified total and/or poly(A+) mRNA from cells and from tissues. Denaturing gel electrophoresis, RNA transfer techniques, isotopic and non-isotopic probe labeling methods, hybridization, x-film exposure, interpretation of results.

❖ **Polymerase Chain Reaction(PCR)**

Fundamentals of PCR, primer design, PCR amplification tools and techniques, hot-start PCR, TA cloning, TOPO cloning, characterization of PCR products, applications of the PCR technique, Long-range PCR and alternative amplification.

❖ **DNA Sequencing**

Basics and applied methods of DNA sequencing, modern day tools and instruments for sequencing, dideoxy sequencing, 454 sequencing, Illumina, ABI SOLID, applications of sequencing in drug discovery and development, single nucleotide polymorphism (SNP)s identification and characterization techniques, SNPs applications in modern day drug discovery, CNV identification, identification of gross chromosomal deletions. Application of high throughput sequencing in genome wide association study.

❖ DNA Library Construction

Phage library construction vs. cloning into plasmids, fundamentals of DNA library construction, random subclone generation, random fragment end-repair, enzymes and type of DNA utilized, steps involved in titering a library, screening the library, identification and characterization of clones, competent cell preparation, and bacterial cell transformation, blue/white color selection, positive clone retrieval and sub-cloning.

❖ Macroarrays

Basics of macroarray technology, Surfaces and protocols for spotting nucleic acids, formats and designs, Identification of differentially expressed genes by differential hybridization of macroarrays.