

COURSE OUTCOMES (COs)

- **CO1** Specialized computational tools needed to retrieve and analyze data of microbes, their genes, and proteins are taught to improve the skillsets of the students.
- **CO2** Knowledge of modern development in biological sciences and in microbiology making use of Nanotechnology is imparted.
- **CO3** Principles, working, and applications of sophisticated instruments used in microbiology and biotechnology are taught.
- **CO4** Use of computers to retrieve data from biological databases and their analysis is learnt by students.

Unit 1: Bio-nanotechnology

- Introduction to the concept and principles of nanotechnology
- Nanomaterial in nanotechnology: Nanoparticles, Quantum Dots, Nanotubes, Nanowires
- Development of nanotechnology-Timelines and Progress
- Techniques and methodology used to study nanoparticles
- Biosensors, Molecular recognition devices, Lab on Chip- concepts and applications
- Biological Nanoparticles- Plant and Microbial
- Application of nanoparticles in molecular biology, industry, agriculture, and environment

Unit 2: Advances in Instrumentation

Principle, working, and applications of:

- Atomic absorption Spectrophotometer (AAS)
- Fourier Transformation Infrared Spectroscopy (FTIR), Matrix Assisted LASER Desorption/Ionization Time of Flight (MALDI-ToF), Mass spectrophotometer (MS)
- High-Performance Liquid Chromatography (HPLC), Gas chromatography (GC)
- Nuclear Magnetic Resonance (NMR)

Unit 3: Bioinformatics-I

- Introduction to bioinformatics
- Introduction to computers and bioinformatics
- Biological databases
- Pairwise sequence alignment: Global sequence alignment vs local sequence alignment
- Phylogeny
- Application of bioinformatics in Proteomics, Genomics, Transcriptomics

Unit 4: Bioinformatics-II

- The dot plot, scoring matrices, FASTA, and BLAST algorithms
- Protein Profiles, motifs, and feature identification
- Homology modeling and HMM algorithm
- Bioinformatic drug discovery pipeline

REFERENCE

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No.	Name	Author
1.	Bio nanotechnology: Principles and Applications	Anil Kumar
2.	Essential Bioinformatics, Cambridge	Jin Xiong
3.	Bioinformatics: An Introduction 3 rd Edition	Jeremy Ramsden
4.	Bioinformatics and Functional Genomics 3 rd Edition	Jonathan Pevsner

WEBLINKS

e-PGPathshala:

1. Bio-nanotechnology:

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=t5vt4STquHRj94mcOBMr5g==>

- Paper-11 Module-13 Nanotechnology-based delivery systems for biotechnological applications
- Paper-11 Module-35 Food Nanotechnology: an introduction
- Paper-11 Module-16 Carbon based nanomaterials
- Paper-11 Module-11 Nanotechnology, Nanomedicine and Nanomaterials: Applications in biotechnology
- Paper-11 Module-14 Dendrimers
- Paper-11 Module-15 Quantum dots
- Paper-11 Module-16 Carbon nanotubes
- Paper-11 Module-24 Environment Remediation Using Nanotechnology
- Paper-11 Module-28 Risks associated with nanotechnology
- Paper-11 Module-31 Medical Nanobiotechnology Applications
- Paper-11 Module-38 Nutraceuticals in Nanotechnology

2. Instrumentation:

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=1+p0z2ZbAGSfsyfLITzgZQ==>

- Paper-01 Module-28 Atomic absorption spectroscopy
- Paper-10 Module-24 to 26 FTIR
- Paper-06 Module-30 to 35 Mass spectrometry
- Paper-03 Module-09 to 14 HPLC
- Paper-03 Module-04 to 08 Gas chromatography

3. Bioinformatics:

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=MNhNzp1RQIU+6LM40KjY1Q==>

- Paper-13 Module-01 Overview of Bioinformatics
- Paper-13 Module-02 & 03 Database
- Paper-13 Module-06, 07 & 19 Sequence Alignment
- Paper-13 Module-09 BLAST

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