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M.A. M.Sc. Biochem Exam May/June-2017  
Second/Fourth Semester  
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## 401: FRONTIER TECHNOLOGIES IN BIOSCIENCES

### FOR COLLEGE ONLY

#### UNIT I

1. Introduction and organization of animal cell and tissue culture laboratory, Contamination, Primary and established cell line culture
2. Serum and protein free defined media and their applications, measurement of viability and cytotoxicity
3. Introduction to balanced salt solutions and simple growth medium: Brief introduction of the chemical, physical and metabolic functions of different constituents of culture medium, Role of carbon dioxide and supplements
4. Biology and characterization of the cultured cells, measurement of parameters of growth

#### UNIT II

1. Basic techniques of mammalian cell culture: Disaggregation of tissues, Primary and established cell line cultures and mass culture techniques
2. Stem cell technology: Types of stem cell, manipulations of stem cells
3. Factors governing manipulation of stem cell, Therapeutic cloning for embryonic stem cell (ESC's)
4. Applications of stem cell cultures

#### UNIT III

1. Introduction of plant tissue culture and laboratory organization
2. Tissue culture media (composition and preparation), initiation and maintenance of callus and suspension culture, single cell clones
3. Organogenesis : Somatic embryogenesis, transfer and establishment of whole plants in soil
4. Protoplast isolation, culture, regeneration and somatic hybridization and applications of plant tissue culture

#### UNIT IV

1. Nanobiotechnology: Introduction to nanoscience, Tools for measuring nano structures
2. Biosensor development and its applications
3. Microarray chips: Types of DNA chips and their production
4. SNP's and GMS (Genome mismatch repair)

#### UNIT V

1. Functional proteomics: Methods of proteome analysis
2. Human Genome Project (HGP): The human genome/ Social implications
3. Forensic applications of DNA analysis
4. Patents and intellectual property: Intellectual property areas : Trademarks, Copyrights. The process of obtaining a patent, Why obtain a patent, Recent changes in IPR and Patent policies

#### Reference Books:

1. DNA Microarrays and Gene Expression by P.Baldi and G.W.Hatfield
2. Protein-Protein Interactions by Erica Golemis
3. A passion for DNA (Genes, Genomes and Society) by J.D.Watson
4. Modern Genetic Analysis by Anthony J.F. Griffiths et al.
5. Nanobiotechnology- Next Big Idea by Mark, Ratner, Daniel Ratner

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6. Gene Cloning by T.A. Brown
  7. Latest information on academic Websites
- Note: All text books are of latest editions.

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FOR COLLEGE ONLY (3)

402: BIostatistics, COMPUTERS AND BIOINFORMATICS

UNIT I

1. Introduction to Biostatistics, Common terms, notations and applications, Statistical population and sampling methods
2. Classification and Tabulation of data, Diagrammatic and graphical presentation
3. Frequency distribution and measures of central value
4. Measures of variability, Standard deviation, Standard error, Range, Mean, Deviation, Coefficient of variation

UNIT II

1. Correlation and Regression, Positive and negative correlation, Calculation of correlation coefficient and regression coefficient, linear regression and regression equation
2. Test of significance; t-test, chi-square test and analysis of variance
3. Design of experiment, randomization, replication, local control, complementary randomized, randomized block design
4. Factor analysis, Path analysis

UNIT III

1. Introduction to computer basics, Concept of Hardware and Software, DOS, Internal and External commands
2. Concept of file, folders, directories and their management
3. Office applications: MS-Office, MS-Word, MS-Excel and MS-Power Point
4. Open office on Linux: Word Processor, Spreadsheets, Impress

UNIT IV

1. Overview of Bioinformatics: Introduction to MEDLINE on PubMed System for accessing Biological Information, Entrez, Swissport, PIR, NCBI
2. Sequence databases: Contents, Structure and annotation for Human Genome Databases, Plant Genome Databases, Retrieving and installing a program (Tree Tool), Multiple sequence alignment programme-Clustal W, X.
3. Use of genome analysis programs: BLAST, FASTA
4. CGC, Motif and Profile, Sequence search

UNIT V

1. Predictive methods : Predictive methods using nucleotide sequences and protein sequencing, physical properties based on sequences, secondary structures, folding classes, tertiary structures
2. Genome mapping applications : EST and functional genomics, EST clustering, gene discovery, ORF prediction, molecular modeling
3. Phylogenetic analysis : Phylogenetic reconstruction, distance matrices, Parsimony, Phylips
4. Submitting DNA sequences to database

**Reference Books:**

1. Introduction to Bioinformatics: A theoretical and practical approach by Stephen a Krawetz and DD Womble
2. Bioinformatics, Genes, Proteins and Computers by CA Orengo, DT Jopnes and JM Thornton
3. An Introduction to Computational Biochemistry by C.Stan and T.Sai

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4. Instant Notes on Biochemistry by P. D. Leitch and R. M. Twyman
5. Statistics for Biologists by G. A. Fisher and R. A. Fisher
6. Fundamentals of Biochemistry by E. D. Maclellan
7. Molecular Biochemistry: Principles, Applications and Strategies by S. Maulik and S. D. Patel
8. Methods in Biochemistry by G. L. Cantow
9. Statistical Methods by G. L. Cantow
10. Statistical Methods by W. G. Cochran

Note: All text books are of latest editions.

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**403 : Lab Course VII**

Consists of practical exercises based on 401 & 402

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**404 : Research Project Work**

To be carried out on a specific defined objective under the supervision of a teacher. The work is compiled in the form of dissertation.

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