UNIT I
1. Stem cell Technology: Types of Stem cells.
2. Manipulation of stem cells and applications in medicine.
3. In vitro fertilization: Principle, Methods, applications and ethics.
4. Cloning of animals: Methods and applications.

UNIT II
1. Genome & Genomics: Concept and methods of genome analysis, genome projects.
2. Transcriptome & Transcriptomics: Concept and methods.
3. Proteome and Proteomics: Concept and methods of Proteome analysis.
4. Metabolome and Metabolomics.

UNIT III
2. DNA nanotechnology: Structural DNA assembly-Nanopores and
4. Nano biosensors-nano scale organization-characterization-quantum size effects-
sensors of the future.
5. Tools for measuring nanostructures. Microscopies-SEM, TEM, AFM modern advances-
 microanalysis-optical detection of single molecule.

UNIT IV
1. Biochemical diagnostics: Biochemical markers of disease diagnosis and their
 applications.
2. Introduction and Concept of Molecular Diagnostics: DNA diagnostics: PCR based
diagnostics, RAPD and RFLP etc. in diagnostics.
3. Microarray Technology, Array-based diagnostics, SNP's (Single Nucleotide
Polymorphism) and GMS (Genome Mismatch Signals) and diagnostic significance.
4. Western blot diagnostics, Immunoarrays, Phage display concept and applications of
 phage display.

UNIT V
1. Biosensors: Concept, principle, Organization of biosensor and types.
2. Biosensors: Health and medicine.
4. Bacterial biosensors; Array Biosensors.

Practical Exercises
Appropriate exercises based on theory.

Reference Books
1. DNA Microarrays and gene expression by P. Baldi & GW Hatfield
2. Protein – Protein Interactions by Erica Golemis
3. A passion for DNA (Genesm genomes and Society) By JD Watson
4. Modern Genetic analysis by Anthony JF Griffiths et al.
5. Nanobiotechnology: next big idea by Mark, Ratner, Daniel Ratner
6. Gene cloning by TA Brown
7. Latest information on academic Web sites.

Note: All books are of latest editions
UNIT I

2. Search engines: Google, Pub Med, NCBI, EMBL.
3. Protein and DNA databases: Swiss port, PIR, OMIM, Embark, ENTREZ, DDJB, MIPS, Hovered, ECDC, Cambridge small molecular crystal structure data bank.
4. Analysis packages: Commercial databases and packages, GPL software for bioinformatics, web based analysis protocol.

UNIT II

1. Sequence Databases: Contents, Structure, and annotation for Human Genome Databases, Plant Genome Databases, Retrieving and Installing a program (Tree Tool), Multiple sequence alignment program- Clustal W, X.
2. Genome analysis programs: BLAST, FASTA, CGC, Motif and Profile, Sequence search.
4. Data models: Instances and schemes; E-R model, E-R diagrams, reducing E-R diagrams to tables, network data model.

UNIT III

2. Computer aided drug designing: Basic principles, docking, ADME/ TOX
3. Genome mapping applications: EST and Functional genomics, EST clustering gene discovery, ORF prediction.
4. Use of genome analysis programs, primer designing tools.

UNIT IV

2. Sequence comparison; Sequence pattern; Regular expression based pattern; Theory of profiles and their use in sequence analysis.
3. Markov models: Concept of HMMS; Baum-Welch algorithm; Use of profile HMM for protein family classification; Pattern recognition methods.
4. Structure determination: X-ray crystallography; NMR spectroscopy; PDB (Protein data bank) and NDB (Nucleic acid data bank); File formats for the storage and dissemination of molecular structure.

UNIT V

1. Modeling and conformational analysis: Homology modeling; Threading and protein structure prediction.
2. Force fields; Molecular energy minimization, Monte Carlo and molecular dynamics simulation.
3. Tagging of genes and molecular modeling.
Reference Books

1. Introduction to Bioinformatics: A theoretical and practical approach by Stephen A Krawetz and DD Womble
2. Bioinformatics Genes, Proteins & Computers by CA Orenge, DT Jopnes and JM Thornton
3. An Introduction to Computational Biochemistry by C Stan .T Sai
4. Instant notes on Bioinformatics by DR Westhead, JM Perish & RM Toyman
5. Essential Bioinformatics by Jin Xiong
6. An Introduction to Bioinformatics Algorithms by Neil C. Jones, Pavel Pevzner
7. Bioinformatics: Sequence and Genome Analysis by David W. Mount
10. Bioinformatics Technologies by Yi-Ping Phoebe Chen
UNIT I

1. Creativity and Entrepreneurial personality and Entrepreneurship in Biotechnology
2. Organizational Structure and management
3. Capital management
4. Product innovation and management
5. Government schemes for commercialization of technology (Eg. Biotech Consortium).

UNIT II

2. Operational research: Linear programming, PERT and CPM; Production planning and Control-Scheduling-Gantt Charts-Documentation-Production-Work Order.

UNIT III

1. Kaizen (Continuous improvement in product and management)
2. Six Sigma
3. Biotech enterprises: Small, Medium and Large
4. Quality control in Biotech industries.

UNIT IV

1. Government regulations for Biotech products
2. Public policy, regulatory and ethical challenges facing the biotechnology entrepreneurship
3. Business development for medical products

UNIT V

3. IPR and Technology Transfer, Role if patentee and Licensor

Reference Books

1. Innovation and Entrepreneurship in Biotechnology: Concept, Theories and Cases by Hyne & Others.
4. Entrepreneurship in Biotechnology: Managing For Growth from start-up: By Martin

UNIT 1

UNIT 2

UNIT 3

UNIT 4
UNIT I

5. Marker Evaluation and Control-TYPES, process, obstacle to marketing control-marketing Ethics.

UNIT II

3. Materials Cost-Material purchasing, receiving, storing, issuing, including pricing of issues.
5. Overheads- Identifying the overheads with the cost center-Allocation, Appointment and Absorption-Under Absorption and Over Absorption of Overheads.

UNIT III

1. Materials and Logistic Management: materials management- Evolution, Scope and Objectives-interface with other functions.
2. Forecasting-Methods of forecasting-Moving Average Method, Regression Analysis, Exponential Smoothing Method.
3. Inventory-Types of Inventory-Need of Inventory- Cost associated with Inventory-Basic EOQ model-EOQ with discounts-Classification of material-ABC Analysis- VED, FSN, GOLF, SOS-fixing of inventory levels.

UNIT IV

2. Distribution Network Planning system-Location-Number and size of facilities-Stocking Policies-Storage and handling capacities.
3. Packaging-Principles, functions and type-Containerization-Concepts-Infrastructure-
Customs Issues-Service Utilization Modes-Rail, Sea and Road.
4. Role of Freight and Insurance in Logistics.
5. Concept of Supply Chain Management and its strategic role in the organization-Intra
and Inter Organization Supply Chain.

UNIT V
1. Market Research
2. Impact of Govt. policies on marketing
3. International marketing
4. Consumer laws

Practical Exercises: Appropriate exercises based on theory

References Books
1. Pharma management: Smith
2. Establishment of pharmaceutical factory: Aganil
3. Dispensing of pharmaceutical students: Cooper and Gunn's.
4. The science and practice of pharmacy: Remington
5. The theory and practice of industrial pharmacy: Lachman, Lieberman & Kanig.
7. Marketing channels: Stern & Adel
8. Theory on distribution channel structure: Louis Bucklin.
9. Marketing Management by Philip Kotler
10. Best practices in Biotechnology business development: Yali Friedman, Ph.D.; Editor
12. Challenges of 21st Century by Peter Drucker

403: Lab course VII: Based on exercises in 401 and 402
Technical / Review Writing

404: Project Work