Course Code	HM-BT501					
Category	Humanities and social Science and Management course					
Course title	Fundamentals of Management for Engineers					
Scheme and Credits	L	T	P	Cr. Points	Lec. Hrs.	Semester: V
	2	0	0	2	30	
Pre-requisites/ Co-requisites (if any)	- Mathematics (10+2)					

Course Objective:

The objectives of the course are:

1. To make the students understand the fundamental principles and practices of management, its function, behavior, hierarchy and importance in an organization.
2. To emphasize the different functional areas of management: finance, production, marketing, and human resource.
3. To address the student the role of information technology in management.

Course Content:

Module I: [5 Lectures]
Organizational Behaviour and General Management:
School of Management Thought (Taylor's Scientific Management, Fayol's Administrative Theory, Elton Mayo's Human Relation Approach). Motivation Theories (Maslow's, ERG, Herzberg's), Management as an Art and Science, Functions of Management, Managerial Hierarchy and Decisions, Types of Organization (Line Organization, Line and Staff Organization, Functional Organization), Role of a Professional Manager, Importance of Management.

Module II: [6 Lectures]
Financial Management and Cost:
Functions of Financial Management, Concept of Assets & Liabilities, Ratio Analysis (Importance, Current Ratio, Liquid Ratio, Proprietory Ratio, Debt-Equity Ratio Gross Profit Ratio, Net Profit Ratio, Operating Ratio, Stock Turnover Ratio, Debtors' Velocity Ratio, Creditors' Velocity Ratio), Cost (Concept of Costs, Types of Cost, Elements of Cost, Cost Sheet), Cost-Profit-Volume Analysis, Depreciation (Causes, Types, Calculation by Straight Line Method and Declining Balance Method).

Module III: [6 Lectures]

Manufacturing Management:
Production as a Conversion Process, Productivity, Types of Production System (Project, Jobbing, Batch, Mass & Flow, Process), Types of Plant Layout (Functional, Product, Fixed Position), Production Planning and Control, Inventory Control (Standard EOQ Model, EOQ with Price discount), Statistical Quality Control (Acceptance Sampling, OC Curve and Control Charts), Johnson's Rule for (n×2) and (n×3) Machines, Forecasting (Qualitative Methods, Quantitative Methods - Moving Average, Exponential Smoothing, Trend Analysis, Linear Regression).

Module IV: [5 Lectures]
Marketing Management:
Marketing Concepts (Need, Want, Demand, Production Concept, Product Concept, Selling Concept, Marketing Concept, Societal Concept), Difference between Selling and Marketing; Elements of Marketing Mix- the 4 P's. Market Segmentation (STP Concept, Need for Segmentation, Bases of Segmentation, Types of Segmentation), Advertisement and Sales Promotion, Simple Marketing Strategies (SWOT Analysis, BCG Matrix).

Module V: [4 Lectures]
Human Resource Management:
Human Resource Planning, Recruitment and Selection, Training and Development, Performance Appraisal, Wage and Salary Administration, Industrial Relations, Trade Union, Collective Bargaining.

Module VI: [4 Lectures]
Computer Application in Management
Overview of Computer Based Information Systems at different Managerial Levels (Transaction Processing System, Management Information System, Decision Support System, Executive Support System, Interrelationship between TPS, MIS, DSS, ESS), Enterprise Resource Planning, E-Commerce (B-2-B, B-2-C, C-2-C, B-2-G, C-2-G), Networking (LAN, MAN, WAN, Intranet, Internet, Extranet).

Textbooks:

1. Dr. Premvir Kapoor, Principles and Practices of Management, Khanna Publishing House (2019)
2. L. C. Jhamb, S. Jhamb (2010). Industrial Management-I, 9th Ed., Everest Publishing House
3. L. C. Jhamb, (2010). Industrial Management-II, 10th Ed., Everest Publishing House
4. D. K. Bhattacharyya, (2010). Industrial Management, 1st Ed., Vikash Publishing House Pvt. Ltd.
5. N. Kango, D. Gera, P. Bawa (2010). Industrial Management, 1st Ed., Kalyani Publishers.
6. A. Bhat, A. Kumar (2008). Management Principles, Processes, and Practices, Oxford University Press.

Reference Books:

1. S. N. Chary, Production and Operation Management, Tata McGraw Hill
2. Phillip Kotler, Marketing Management, Prentice Hall/Pearson Education.
3. S. Pande, S. Basak (2012), Human Resource Management - Text and Cases, Dorling Kindersley (India) Pvt. Ltd.
4. S. P. Robbins, Organizational Behaviour, Prentice Hall
5. K. C. Loudon, J. P. Loudon (2006). Management Information Systems - Managing the Digital Firm, 9th Ed., Prentice-Hall of India Pvt. Ltd. (Pearson Education)
7. M. M. Jana, N. K. Samanta (2007). An Overview of Information Technology and its Application in Business, New Central Book Agency (P) Ltd.
8. Khan & Jain, Management Accounting, Tata McGraw-Hill.
9. B. Banerjee (2007) Cost Accounting - Theory and Practice, 12th Ed., Prentice-Hall of India Pvt. Ltd.
10. K. Aswathappa, Human Resource Management, Tata McGraw Hill
11. S.C. Sharma & T.R. Banga, Industrial Engineering & Management, Khanna Book Publishing Co. (P) Ltd., Delhi

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Learn** general principles, practices, and process of management; and fundamentals of organizational behavior in playing effective managerial role in an organization.
2. **Able to determine**, the financial health of the firm through financial statement analysis and efficiency of the firm through optimum allocation of cost.
3. **Demonstrate and analyze** the fundamentals of production management and can make effective and efficient decision for production planning and control.
4. **Capable to frame** optimum marketing policies to initiate, and maximize sales of the firm.
5. **Obtain an overview** of digital firm through the applications of computer in automating the business processes of a traditional firm

Course Code	PC-BT501					
Category	Professional Core					
Course title	Genetics					
Scheme and Credits	L	T	P	Cr. Points	Lec. Hrs.	Semester: V
	3	1	0	4	40	
Pre-requisites/ Co-requisites (if any)	- Biology (10+2 Level) - Microbiology - Molecular Biology					

Course Objective:

The objectives of the course are:

1. Course will cover principles of prokaryotic and eukaryotic cell genetics.
2. Provide an understanding of Gene structure and function, Mutation, Chromosome aberrations and Evolution.
3. Students will acquire knowledge of Population genetics and its applications.

Course Content:

Module I: 10L Cytogenetic, Mendelism and its extensions
Beginning of genetics; Cell structure and cell division; Early concepts of inheritance. Mendel's laws; Chromosomal theory of inheritance; Multiple alleles, Gene interactions. Sex determination, differentiation and sex-linkage; Sex-influenced and sex-limited traits; Linkage-detection, estimation; Recombination and genetic mapping in eukaryotes; pedigree analysis; Extra chromosomal inheritance, Pleiotropy, Linkage Disequilibrium, Polygenic inheritance

Module II: 10L
Genetic fine structure analysis (rII locus), Overlapping genes, Pseudogenes, Oncogenes, Structural and numerical changes in chromosomes: euploidy and aneuploidy, and their genetic implications; Genetic disorders and Behavioural genetics.

Module III: 10L Microbial Genetics:
The Bacterial genome: Bacterial gene pool and evolution of bacterial genetic diversity.
Genetic aspects of extrachromosomal elements: plasmids and transposons.
Gene transfer: conjugation, transduction, transposition, recombination and allelic exchange; Recombination and complementation analysis; gene mapping.
Bacteriophages: Lytic Development,Genetics, and Transduction; Lysogeny: the λ Paradigm

Module IV: 10L Mutation, Evolution and Population Genetics
Difference between DNA lesions and mutation; mechanisms of mutations; various kinds of DNA mutations (point mutation, insertion, deletion, nonsense, nonsense suppressor,

frameshift and reversion), Hardy-Weinberg equilibrium, changes of gene frequency, continuous variation and extensions; heritability and its measurements, QTL mapping. Inbreeding and heterosis, Speciation and evolution

Textbook:

1. Strickberger, Genetics, 3rd edition, McMillan, 1985.
2. Snustad & Simmons, Principles of Genetics, 4th Edition, Wiley, 2005.

Reference Books:

1. Griffiths et al, Modern genetic analysis, 2nd Edition, Freeman, 2002.
2. Microbial Genetics, 2nd edition, Stanley R. Maloy, John E. Cronan, David Freifelder. Pub: Jones and Bartlett Publisher Inc.
3. Alberts et al, Molecular Biology of The Cell, 2nd Edition , Garland 2007.
4. Lewin, Genes IX, 9th Edition , Jones & Bartlett, 2007.
5. Genetics, 9th revised multicolor edition. P.S. Verma & V.K. Agarwal. Pub: S. Chand & Co.
6. Molecular Genetics of Bacteria by Jeremy W. Dale and Simon F. Park, Wiley-Blackwell, 5th Edition 2010.

Web Reference:

1. NPTEL: http://nptel.ac.in/courses/102103016/
2. ePgPathshala:http://epgp.inflibnet.ac.in/ahl.php?csrno=3

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Describe**, detailed understanding of the principles of Mendelian inheritance and extensions.
2. **List** the structure and function of the DNA molecule to its functional role in encoding genetic material.
3. **Describe** normal chromosome number, structure, and behaviour in organisms, and understand the reason and effect of various aberrations in chromosome.
4. **Understand** bacterial mechanism of horizontal gene transfer methods.
5. **Understand** how to identify and classify mutations in DNA.
6. **Apply** the Hardy-Weinberg Law in analysing population genetics for gene frequency, sex linkage, equilibrium, and heterozygote frequency.

Course Code	PC-BT502					
Category	Professional Core					
Course title	Bioinformatics					
Scheme and Credits	L	T	P	Cr. Points	Lec. Hrs.	Semester: V
	3	0	0	3	40	
Pre-requisites/co-requisites (if any)	There are no enforced requisite courses for Bioinformatics. However, some knowledge of molecular biology, any computer programming language and database & networking would be advantageous.					

Course Objectives:

1. To educate the interdisciplinary nature of advances in bioinformatics
2. To provide basic understanding of how biological data is stored and retrieved from various biological databases.
3. To develop an understanding of algorithms of sequence alignment and scoring algorithms.
4. This course teaches will teach Perl and UNIX command

Course Content:

Module 1 (8 L):

Definition and application bioinformatics to biological research and a general view about application relating biological research. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed; Protein Data Bank (PDB).

Module 2 (10 L):

Sequence analysis: Introduction to sequence analysis, local and global alignment, pair wise and multiple alignment, sequence alignment algorithm: Needleman and Wunsch algorithm, Smith-Waterman, BLAST, FASTA. Substitution Matrix: PAM and BLOSUM.

Introduction to the idea about phylogenetics analysis through multiple sequence alignment: A brief introduction of gene prediction: Prediction of ORF, Promoter. Motif identification-Pfam, Prosite.

Module 3 (10 L):

Protein Secondary and tertiary structure prediction: Chou Fasman method, Hidden markov model and neural network, Homology Modelling, Structure visualization methods (eg: RASMOL, CHIME) Introduction to energy minimization, QSAR and their relation in drug design.

Module 4 (12 L):

UNIX command. Perl programming with bioinformatics application, Bio-Perl.

Textbooks:

1. Xiong.J, Essential Bioinformatics, Cambridge University Press

2. Ghosh and Mallick, Bioinformatics-Principles and applications Oxford University Press.

3. James Tisdall, Beginning Perl for Bioinformatics, SPD

Reference books:

1. David W. Mount. Bioinformatics: Sequence and Genome Analysis ,2nd Edition, CSHL Press, 2004.
2. Jonathan Pevsner, Bioinformatics and Functional Genomics, 1st Edition, Wiley-Liss, 2003.
3. Cynthia Gibas and Per Jambeck, Introduction to Bioinformatics computer Skills, 2001 SPD

4. Atwood, Introduction to Bioinformatics, Person Education

5. Smith, D.W, Biocomputing : informatics and Genome Project,.,1994, Academic Press, NY.

6. Baxevanis, A.D, Quellette. B.F.F, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, , John Wiely & Sons.

7. Andrew Leach, Molecular Modelling: Principles and Applications,Pearson Education.

Web Reference:

http://www.ncbi.nlm.nih.gov/

http://www.expasy.org/

http://www.uniprot.org/

http://www.rcsb.org/pdb

Course Outcomes:

After completion of the course, the student will be able to:

1. **Understand** the theoretical basis behind bioinformatics**.**
2. **Search** databases accessible on the WWW for literature relating to molecular biology and biotechnology
3. **Manipulate** DNA and protein sequences using stand-alone PC programs and programs available on the WWW and understand the programming language PERL.
4. **Find** homologues, analyze sequences, construct and interpret evolutionary trees.
5. **Analyze** protein sequences, identify proteins, and retrieve protein structures from databases. **View and interpret** these structures. **Understand** homology modeling and computational drug design.
6. **Able to query** biological data, **interpret and model** biological information and **apply this** to the solution of biological problems in any arena involving molecular data.

Course Code	ES-BT501					
Category	Engineering Science					
Course title	Transfer Operation II					
Scheme and Credits	L	T	P	Cr. Points	Lec. Hrs.	Semester: V
	3	0	0	3	40	
Pre-requisites/ Co-requisites (if any)	-					

Course Objective:

The purpose of this course is to introduce the undergraduate students with the most important separation equipments in the process industry, and provide proper understanding of unit operations.

Course Content:

Module I: [10 Lectures]

Introduction to Mass Transfer: Molecular diffusion in fluids, Diffusivity, Mass Transfer Coefficients, Interphase Mass Transfer, Gas Absorption, countercurrent multistage operation, Packed Tower.

Module II: [10 Lectures]

Distillation:
Vapour-liquid equilibrium, Rayleigh's Equation, Flash and Differential distillation, continuous rectification, McCabe-Thiele Method, bubble cap and sieve distillation column.

Module III: [10 Lectures]

Extraction, Drying and Crystallization: Liquid–liquid equilibrium. Liquid extraction, Stage wise contact; Liquid-solid equilibria, Leaching; Batch drying and mechanism of batch drying, Principle and operation of a spray drier, Preliminary idea of Crystallization.

Module IV: [10 Lectures]

Advanced Separation Processes:
Dialysis, ultrafiltration, reverse osmosis, pervaporation, electrodialysis and membrane separation.

Textbooks:

1. Unit Operations of Chemical Engineering: McCabe, Smith & Harriot, TMH, 5thedition

Reference book:

1. Transport Processes & Unit operations: Geankopolis, PHI, 3rd edition
2. Chemical Engineering, Vol-I & II: Coulson & Richardson, Butterworth Heinemann
3. Treybal, R.E., Mass-Transfer Operations, MGH
4. Perry, Chilton & Green, Chemical Engineers' Handbook, MGH

Web Reference:

3. NPTEL: http://nptel.ac.in/courses/103103035/e

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Understand** the molecular diffusion in fluids along with the mass transfer co-efficient.
2. **Understand** the concept of interphase mass transfer mechanism and fundamentals of absorption tower and packed tower.
3. **Understand** the role of Vapour-liquid equilibrium in different types of distillation and illustrate the McCabe-Thiele Method.
4. **Understand** the liquid–liquid equilibrium in extraction and liquid-solid equilibrium in leaching.
5. **Understand**, **identify and illustrate** the mechanism of drying and the working principle of different types drier also understand the fundamentals of crystallization**.**
6. **Understand** the fundamentals of advance separation process.

Course Code	**OE-BT501**					
Category	**Open Elective Course**					
Course title	**Data Base Management System and Computer Networking**					
Scheme and Credits	**L**	**T**	**P**	**Cr. Points**	**Lec. Hrs.**	**Semester:**
	3	**0**	**0**	**3**	**40**	**V**
Pre-requisites/ Co-requisites (if any)	**Data Structure and Algorithm**					

Course Objective:

The objectives of the course are:

1. To compose the students aware of the concepts, practices and application of the database, DBMS, SQL and Computer Networking at the end of the course in above mentioned area.
2. To recognize the magnitude of DBMS with Computer networking in IT industry.

Course Content:

Module I: [15 Lectures]

Introduction

Database System Concepts & Architecture, File System, Data Independence, Database Languages, Database Manager, Database Administrator, DBA Functions, Database Users, Scheme and Instances, Data Models-ER model, Relational Data model .

Module II: [5 Lectures]

RELATIONAL DATABASE DESIGN

Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition,1NF,2NF,3NF.

Module III: [5 Lectures]

Structured Query Language

Queries of Data Definitions and Data Manipulation in SQL, Introduction to PL/SQL.

Module IV: [15 Lectures]

Computer Networking: LAN/MAN/WAN, OSI 7 layer Model, Inter Networking, WWW, URLs, Search Engines, Electronic Mails, Distributed System, Distributed Database System Concepts, Application: Genome Data Management

Textbooks:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts, 4 th ed, Mc.Graw Hill, Computer Science Series.

Reference books:

1. Elmasri Ramez and Novathe Shamkant,"Fundamentals of Database Systems", Pearson.

2. Ramakrishnan: Database Management System, McGraw-Hill

3. R.P. Mahapatra, Database Management Systems, Khanna Publishing House

4. Gray Jim and Reuter Address, "Transaction Processing: Concepts and Techniques", Moragan Kauffman Publishers.

5. Jain: Advanced Database Management System, CyberTech

6. Date C. J., "Introduction to Database Management", Vol. I, II, IIIPearson.

7. Ullman J. D., "Principles of Database Systems", Galgottia Publication

8. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of

India, New Delhi

9. Ramez Elmasri, Shamkant B.Navathe "Fundamentals of Database Systems", Pearson

10. Arun K.Majumdar, Pritimay Bhattacharya "Database Management Systems", Tata

McGraw

Web Reference:

1. https://onlinecourses.nptel.ac.in/noc18_cs15

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Define and understand** the fundamentals of Data base management System and traditional file system.
2. **Understand and explain** the concepts of Data Model.
3. **Make use** of the tools to implement Entity Relationship diagrams.

4. **Utilize and take** part in the normalization of the real world database to remove redundancies.
5. **Elaborate** the importance on Distributed Database System Concepts.
6. **Discuss** the importance of Computer Networking and OSI 7 layer Model and able to judge the environmental, societal and market issues specific to software development.

Course Code	**PE-BT501**					
Category	**Professional Core Elective**					
Course title	**Biorector Design And Analysis**					
Scheme and Credits	**L**	**T**	**P**	**Cr. Points**	**Lec. Hrs.**	**Semester: VI**
	3	**1**	**0**	**4**	**40**	
Pre-requisites/ Co-requisites (if any)	- **Thermodynamics and Kinetics for Biotechnology** - **Industrial Microbiology and Enzyme Technology**					

Course Objective:

The objectives of the course are:

1. To apply the knowledge of reaction kinetics to understand the basics of reactor design.
2. To understand the relationship between biological phenomena and engineering design for effective bioreactor operations to achieve production

Course Content:

Module I: 5L Basic Principles:

Principles of kinetics for chemical and biochemical reactions, Searching for a Mechanism, Predictability of Reaction Rate, Fundamentals of homogeneous reactions for batch, plug flow, semi-batch, stirred tank/ mixed reactors.

Module II: (15L)

Ideal Reactors for a Single Reaction: batch, plug low reactor (PFR), continuous stirred rank reactors (CSTR)

Non-Ideal Flow: Concept of non-ideal reactor; residence time distribution; models of non-ideal reactors.

The Dispersion Model: Axial Dispersion, Correlations for Axial Dispersion, Chemical Reaction and Dispersion.

Module III: (15L)

Biochemical Reaction Systems: Enzyme fermentation: Mechanistic Models for Simple Enzyme Kinetics, Experimentally Determining Rate Parametersfor Michaelis–Menten Type Kinetics,Reactor consideration (batch, PFR and MFR) for enzyme fermentation. Microbial fermentation: Quantifying Growth Kinetics, Substrate-Limiting Microbial Fermentation for batch, PFR and MFR, Mass transfer in biochemical processes.

Operating considerations: Modifying Batch and Continuous Reactors, Immobilized Cell Systems, Active and Passive Immobilization of Cells, Biological Films, Diffusional Limitations in Immobilized Cell Systems, Bioreactor Considerations in Immobilized Cell.

Module IV: (5L)

Unconventional bioreactors: Hollow fiber reactor, membrane reactor, perfusion reactor, air lift reactor, bubble column reactor for animal and plant cell culture.

BEYOND SYLLABI COVERAGE

Interpretation of biochemical kinetics data: modeling, simulation

Textbook:

1 Levenspiel, O., Chemical Reaction Engineering, Wiley Eastern Ltd.

2. Michael L. Shuler and FikretKargi, Bioprocess Engineering : Basic Concepts (3rd Edition)

Reference books :

1. Bailey &Olis, Biochemical Engg. Fudamentals, MGH, 1990

2. Atkinson, B., Biological Reactors, Pion Ltd., London,1974

3. "Bioreactors in Biotechnology", Ellis Horwood series, 1991. A. H. SCRAGG

Web Reference:

http://nptel.ac.in/courses/102106053/

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Apply** the knowledge of reaction kinetics to understand the basics of reactor design.
2. Apply the knowledge of reaction kinetics principles to **identify and formulate problems** in chemical and biochemical reaction engineering and find appropriate solutions.
3. **Design / development of solutions** of chemical and biochemical reaction kinetics data
4. Able to analyze and **interpret the data of complex problem** on non-ideal reactor analysis.
5. Ability to use **modern engineering and computational tools**, including prediction and modeling to different engineering activities,
6. Understand the relationship between **biological phenomena and engineering design** for effective bioreactor operations to achieve production goals for **societal issues** and **ability to learn** in the broad context of technological changes.

Course Code	**PC-BT591**					
Category	**Professional Core**					
Course title	**Genetics Lab**					
Scheme and Credits	**L**	**T**	**P**	**Cr. Points**	**Lab. Hrs.**	**Semester: V**
	0	**0**	**3**	**1.5**	**36**	
Pre-requisites/ Co-requisites (if any)	**Genetics Theory**					

Course Objective:

The objectives of the course are:

1. Course will cover the mathematical, statistical, and computational basis of genetic analyses.
2. To identify and describe the process of cell division (meiosis and mitosis), as well as predict the outcomes of these process.

Course Content:

1. Laboratory exercises in Chi-square.
2. Preparation of different stages of Mitosis and Meiosis
3. Karyotype analysis and Ideogram preparation of plant/animal/human chromosomes.
4. Study of chromosomal aberrations in mouse bone marrow cell and plant cells.
5. Barr body preparation from buccal smear.
6. Preparation of Pedigree chart of some common phenotypic characters of human

7. Hardy-Weinberg Genetic equilibrium: Study of gene & genotype; frequencies. (PTC Tasters & nontasters)

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Analyze** genetic data using statistical procedures.
2. **Construct** cytological slides for mitotic and meiosis.
3. **Demonstrate** various types of chromosomal aberrations and barr body.
4. **Design** pedigree chart of common human traits.
5. **Calculate** problems based on Hardy-Weinberg equilibrium.

Course Code	**PC-BT592**					
Category	**Professional Core**					
Course title	**Bioinformatics Lab**					
Scheme and Credits	**L**	**T**	**P**	**Cr. Points**	**Lab. Hrs.**	**Semester: V**
	0	**0**	**3**	**1.5**	**36**	
Pre-requisites/ Co-requisites (if any)	**Bioinformatics Theory**					

Course Objectives:

1. To educate the interdisciplinary nature of advances in bioinformatics
2. To provide basic understanding of how biological data is stored and retrieved from various biological databases.
3. To develop an understanding of algorithms of sequence alignment and scoring algorithms.
4. This course teaches will teach Perl and UNIX command

Course Content:

1. Handling of Biological databases eg: NCBI, EMBL, PDB,

2. Pair wise sequence alignment (EMBOSS and BLAST) and multiple sequence alignment (CLUSTAL Omega) and phylogenetic analysis (CLUSTAL Omega)

3. Prokaryotic gene prediction

4. Prediction of secondary and tertiary structure of proteins; structure viewer and analysis.

5. Basic introduction to molecular modeling,

6. Perl programming,

Textbooks:

1. Xiong.J, Essential Bioinformatics, Cambridge University Press

2. Ghosh and Mallick, Bioinformatics-Principles and applications Oxford University Press.

3. James Tisdall, Beginning Perl for Bioinformatics, SPD

Reference books:

1. Cynthia Gibas and Per Jambeck, Introduction to Bioinformatics computer Skills, 2001 SPD

2. Atwood, Introduction to Bioinformatics, Person Education

3 Smith, D.W, Biocomputing : informatics and Genome Project,.,1994, Academic Press, NY.

4. Baxevanis, A.D, Quellette. B.F.F, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, , John Wiely & Sons.

5. Andrew Leach, Molecular Modelling: Principles and Applications,Pearson Education.

Course Outcome:

After completion of the course, the student will be able to:

1. **Describe** the contents and properties of the most important bioinformatics databases, perform text- and sequence-based
2. **Searches, and Analyze and Discuss** the results in pairwise sequence alignment by Dot matrix, dynamic programming and word method.
3. **Find homologues, analyze sequences, construct and interpret** evolutionary trees.
4. **Annotate** gene by Computational methods.
5. **Develop** programming skill in PERL.
6. **Predict** the secondary and tertiary structures of protein sequences.

Course Code	ES-BT591					
Category	Engineering Science					
Course title	Transfer Operation II Lab					
Scheme and Credits	L	T	P	Cr. Points	Lab. Hrs.	Semester: V
	0	0	3	1.5	36	
Pre-requisites/ Co-requisites (if any)	Transfer Operation II Theory					

Course Objectives:

The objectives of the course are:

1. The purpose of this course is to introduce undergraduate students with the most important separation technology/equipments in the process industry.
2. The course provides the students about the proper understanding of unit operations.

Course Content:

1 .To verify Rayleigh's equation.

2. To draw the vapour-liquid equilibrium diagram from Othmer Still.

3. To determine the gas-liquid mass transfer coefficient.

4. To study the drying characteristic curves under constant drying condition in rotary dyers.

5. To study the drying characteristic curves under constant drying condition in tray dyers.

Course Outcome:

After successful completion of this course, the student will be able to:

1. **Understand** the molecular diffusion in fluids along with the mass transfer co-efficient.
2. **Understand** the role of Vapour-liquid equilibrium in distillation and verify the Rayleigh's equation.

3. **Understand** the the role of Vapour-liquid equilibrium in distillation with reflux and verify the Othmer still.
4. **Understand**, **identify and illustrate** the mechanism of drying and the working principle of rotary dryer.
5. **Understand**, **identify and illustrate** the mechanism of drying and the working principle of tray dryer.
6. **Explain** the fundamentals of different working principles related to mass transfer operations.

Course Code	**OE-BT591**					
Category	**Open Elective Course**					
Course title	**Data Base Management System Lab**					
Scheme and Credits	**L**	**T**	**P**	**Cr. Points**	**Lab. Hrs.**	**Semester: V**
	0	**0**	**3**	**1.5**	**36**	
Pre-requisites/ Co-requisites (if any)	**DBMS Theory**					

Course Objective:

The objectives of the course are:

1. To compose the students aware of the concepts, practices and application of the database, DBMS, SQL and Computer Networking at the end of the course in above mentioned area.
2. To recognize the magnitude of DBMS with Computer networking in IT industry.

Course Content:

Structured Query Language

1. **Creating Database**

Creating a Table
Specifying Relational Data Types
Specifying Constraints

2. **Table and Record Handling**

INSERT, DELETE, UPDATE, DROP, ALTER statements

3. **Retrieving Data from a Database**

The SELECT statement Using the WHERE clause
Using Logical Operators in the WHERE clause
Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING **Clause**

Using Aggregate Functions
4. Sharing resources in a LAN, Internet Connection,
Web – browsing, Search Engines, Downloading.

Reference book:

1. Oracle 9i Complete Reference – Oracle Press.

Course Outcome (CO):

After successful completion of this course, the student will be able to:

1. **Outline** the underlying concepts of table creation in database technologies.
2. **Define and demonstrate** DDL and DML commands.
3. **Experiment** with SQL to construct and apply to execute database query using SQL clauses.
4. **List and test** the group function on a database using a RDBMS
5. **Explain** Programming in PL/SQL.
6. **Compose** the use of computer networking for the modern software development.