ANNA UNIVERSITY: : CHENNAI - 25

FACULTY OF TECHNOLOGY

Approved Special Electives for

M.S. / Ph.D. Degree Programs

(upto 21st AC 07.01.2016)

ANNA UNIVERSITY :: CHENNAI – 600 025.

SPECIAL ELECTIVES FOR FACULTY OF TECHNOLOGY

COURSE CODE	COURSE TITLE	L	T	P	M/C
FT1911	Recombinant DNA Technology	3	0	0	3
FT1912	Instrumental Methods in Biotechnology	3	0	0	3
FT 1913	Optics and Microscopy for Biologist	3	0	0	3
FT 1914	Advance Topics in Biophysics	3	0	0	3
FT1915	Research Methodology	3	0	0	100
FT1916	Friction in Textiles	3	0	0	3
FT1917	Advanced Carbohydrate Chemistry	3	0	0	3
FT1918	Gait Analysis	3	0	0	3
FT1919	Protective Clothing for Hazardous Environment	3	0	0	3
FT1920	Fuzzy Control of Chemical Processes	3	0	0	3
FT1921	Advances in Molecular Pathogenesis	3	0	0	3
FT1922	Techniques in Molecular Pathogenesis	3	0	0	3
FT9001	Human Factors Engineering	3	0	0	3
FT9002	Quantification of Process Risks	3	0	0	3
FT9003	Computer Aided Techniques for Safety Engineering	3	0	0	3
FT9004	Prediction and Principles of Protein Conformation	3	0	0	3
FT9006	Microscale and Nanoscale Heat Transfer	3	0	0	3
FT 9008	Leather Product Design Methodology	3	0	0	3
FT 9009	Pedorthics in Footwear	3	0	0	3
FT9010	Membrane Technology in Renal Applications	3	0	0	3
FT9011	Electrochemical Process Engineering For Chemical Engineers	3	0	0	3
FT 9012	Molecular Biology Relevant to Leather Technology	3	0	0	3

FT1911 RECOMBINANT DNA TECHNOLOGY 3 0 0 3

1. SALIENT FEATURES OF CLONING VECTORS 4

Types of cloning vectors viz. Plasmids, cosmids, ssDNA Phages, Yeast cloning vectors, Animal viruses, Ti plasmids and Cauliflower Mosaic Virus.

2. PLASMID BIOLOGY 4

Structural and Functional Organization of Plasmids, Plasmid Replication, Stringent and Relaxed Plasmids, Incompatibility of Plasmid Maintenance.

3. BIOLOGY OF BACTERIOPHAGE LAMBDA 4

Lambda Phage as a natural in vivo vector, in vitro construction of lambda vector, Classes of vectors and their use.

4. ENZYMES IN GENETIC ENGINEERING 5

DNA polymerase, Polynucleotide kinase, T4 DNA ligase, Nick translation system, Terminal deoxynucleotidy1 transferase, Reverse transcriptase Restriction endonucleases Type I & II.

5. ISOLATION OF GENOMIC AND NUCLEAR DNA 4

DNA digestion and restriction fragment analysis and sequencing by chemical, enzymatic and big-bye terminator methods.

6. CLONING AND SUBCLONING STRATEGRY 9

Construction of recombinant DNA: Preparation of competent cell-Transformation, transfection – Recombinant selection and screening; Genomic DNA library; cDNA synthesis strategies – Linkers – Adapters – Homopolymer tailing; Making genomic and cDNA libraries in plasmids and phages. PCR product cloning (TA cloning). Cloning strategies in yeast, E. coli and B. subtilis

7. SELECTION OF RDNA CLONES AND THEIR EXPRESSION PRODUCTS 6

Direct and indirect methods. Drug resistance, gene inactivation, DNA hybridization, colony hybridization and in-situ hybridization (Southern, Northern and Dot blots and immunological techniques Western blotting).

8. GENE MODIFICATION & APPLICATION OF RECOMBINANT DNA TECHNOLOGY 9

Mutagenesis – Deletion mutagenesis, Oligonucletoide derived mutagenesis, Site directed mutagensis – Its applications; Applications of rDNA technology in Diagnistics; Pathogensis; Genetic diversity; Therapeutic proteins-Vaccines. Molecular probes (Production, labelling and uses), P.C.R.

TOTAL: 45 PERIOD

TEXT BOOKS:

1. “Principles of Gene Manipulation” by R.W.Old and S.B.Primrose Third Edition Blackwell Scientific Publication
2. “Genes VI” by B.Lewin
3. “From Genes to Clones” by E.L.Winnecker.
4. “Gene Cloning “ by T.A.Brown

FT1912 INSTRUMENTAL METHODS IN BIO-TECHNOLOGY 3 0 0 3

1. CHROMATOGRAPHY – TECHNIQUES 6

Chromatography – adsorption, affinity, partition (GLC, GC, HPLC, TLC, RPC ETC.)

2. MICROSCOPY – TECHNIQUES 6

Microscopic identification of various microorganisms; phase contrast and confocal microscopy: SEM-TEM microscopy.

3. ELECTROPHORETIC TECHNIQUES 9

Electrophoresis of proteins and nucleic acids; ID & 2D Gels; pulsed-field electrophoresis; capillary electrophoresis; western blotting; gel documentation. Different methods of electrophoresis for proteins, nucleic acids, small molecular weight compounds and immunoprecipitates.

4. SPECTROSCOPIC TECHNIQUES 9

Introduction to principles and applications of Spectroscopic methods UV, Vis, IR, Fluorescence, ORD, CD, PAS, NMR, ESR and mass spectrometry.

5. NUCLEOTIDE AND DNA ANALYSIS 6

DNA Purification, PCR-based analysis; DNA fingerprinting; DNA sequencing.

6. IMMUNO-TECHNIQUES 9

Antiserum production, immunofluroscence, immuno histocompatibility ELISA; location of cells in tissues immunoblotting; monoclonal antibodies. Theory of lyophillyzation and its applications to biological systems. Cell sorter ands their application. Theory of centrifugation and application to biological systems. Rotors angle / vertical, zonal / continuous flow buoyant density centrifugation. Ultracentrifuge – principle and application.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Readings in Scientific American, W.H.Freeman, 1985-1993.

FT 1913 OPTICS AND MICROSCOPY FOR BIOLOGIST 3 0 0 3

1. **Ray-optics:** Fermats principle – Refractive index – Snell's law. Propogation of rays through optical systems – Reflection and refraction through spherical surfaces – Concept of thin and thick lenses – Focal points and focal lengths – Conjugate points and planes – Ray tracing principles. Theory of lens aberration – Various types of aberrations – Methods to compensate and correct optical aberrations.
   6 Hours
2. **Wave Optics:** Interference of light: Amplitude and intensity – Frequency and wave – Michelson interferometer – Newton's ring – Interference spectroscope – Interference filters. Diffraction of light: Resolving power of a telescope and microscope – Diffraction gratings – Dispersion of light – Grating spectrographs.
   6 Hours

3. **Laser and light sources:** Fundamentals of lasers – Laser resonators – Spectral characteristics of laser emission – Single mode and multimode lasers – Tunable lasers. Diode lasers – Diode pumped solid-state lasers. Other light sources – Thermal radiation sources for visible and IR – LEDs – Spectral characteristics of light sources.
9 Hours

Light-matter interaction: Absorption of light by matter – Relation between absorption and reflection – fluorescence – FRET – Scattering and refractive index. Polarization of light – Brewster angle – Nicol prism – Parallel and crossed polarizer – Rochon and Wollaston prism – Polarization by scattering. Reflection from dielectrics – Internal reflection – Phase changes on reflection – Reflection of polarized light – Interference of polarized light – Optical activity and circular dichroism. Total internal reflection – evanescent field and surface plasmon resonance. Characteristic absorption of nucleic acids and proteins – light induced biochemical processes – Quantitative biochemical analysis. Spectrometers and Fluorimeters.
12 Hours

6. **Optical Microscope:** Numerical aperture Telescope – Telephoto lenses – Magnifiers – Objectives – Condensers – Eyepieces – Infinity corrected objectives – Collimators – Kohler illumination – Contrast techniques – Wide-field, dark-field, phase contrast and DIC. Construction of microscopes.
Fluorescence Microscopy – Confocal fluorescence imaging and photo detection – Optical resolution and quantum efficiency. Single molecule fluorescence – Single photon counting techniques – Principles and application of FRET, FCS and TPE microscopy. Total Internal Reflection microscopy – SPR based optical detectors.
12 Hours

Total: 45Hours

REFERENCES:

1. Fundamentals of Optics, F.A. Jenkins and H.E. White., McGraw Hill, India.
2. Photonics – Linear and Non-linear interaction of laser light and Matter, RalfMenzel, Springer
3. Laser Spectroscopy: Basic Concepts and Instrumentation, W. Demtroder, Springer.
4. Light Microscopy in Biology: A practical approach (Second Edition). A. J. Lacey, Ed., Oxford University Press.

Faculty of Technology (**Approved in 10th AC 09.06.2007**) **ITEM NO. FT 10.9(2)**

FT 1914 ADVANCED TOPICS IN BIOPHYSICS 3 0 0 3

1. **Biopolymers:** Model of Polymer chain – conformations and dynamics – Brownian motion – Properties of biopolymers – DNA elasticity – manipulation of single molecule DNA – DNA sensors – microrheological properties of DNA solution. **9 Hours**

2. **Single molecule biophysics:** Biochemistry of single molecule manipulation – biofunctionalised nanoparticles – synthesis, characteriwation and applications of nanoparticles – experimental methods in single molecule detection and manipulation. DNA – protein interaction: Kinetics of binding and unbinding – DNA looping kinetics – compaction and condensation of DNA – nucleoid and chromatin structures – self-assembly and remodeling. **12 Hours**

3. **Force Spectroscopy:** Optical tweezers – theory of optical trapping – calibration of optical forces – dynamics of particle in optical conf9inement – application to microrheological properties of complex systems – optical manipulations of biomolecules and cell. AFM – manipulation and imaging of biomolecules by AFM. Recent development in high – throughput nanoarray techno logy – biotechnology application of AFM. **12 Hours**

4. **Cell mechanics:** Cytoskeleton and cortex – remodeling of cell membrane – cellular mechanics – cell adhesion, migration and aggregation – measurement of receptor – ligand interaction- mechanotransduction – microrheological properties of cell – membrane fluidity. **6 Hours**

5. **Recent trends in biophysics:** Study of seminal papers on the recent development in biophysical analysis involving combination of sensitive manipulation and detection methodologies in probing nanoscale processes in biological systems.

6 Hours

Total : 45 Hours

REFERENCES:

1. Physics in Molecular Biology by Kim Sneppen and Giovanni Zocchi., Cambridge University Press (2005).
2. Laser Tweezers in Cell Biology in Methods in Cell Biology, Vol.55, Michael P. Sheetz (Ed.), Academic Press.
3. Mechanics of the cell by David Boal, Cambridge University Press.
4. Theory of Polymer Dynamics by M. Doi and S.F. Edwards, Clarendon Press – Oxford.

Faculty of Technology (**Approved in 11th AC 05.01.2008**) **ITEM NO. FT 11.07(a)**

FT1915 RESEARCH METHODOLOGY 3 0 0 100

AIM

To impart scientific, statistical and analytical knowledge for carrying out research work effectively.

UNIT I Introduction to Research 9

The hallmarks of scientific research – Building blocks of science in research – Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

UNIT II Experimental Design 9

Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurement of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures.

UNIT III Data Collection Methods 9

Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and non-probabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size.

UNIT IV Multivariate Statistical Techniques 9

Data Analysis – Factor Analysis – Cluster Analysis – Discriminant Analysis – Multiple Regression and Correlation – Canonical Correlation – Application of Statistical (SPSS) Software Package in Research.

UNIT V Research Report 9

Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work.

Total = 45 Hours

REFERENCES

1. Donald R. Cooper and Ramela S. Schindler, Business Research Methods, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2000
2. Uma Sekaran, Research Methods for Business, John Wiley and Sons Inc., New York, 2000.
3. C.R.Kothari, Research Methodology, Wishva Prakashan, New Delhi, 2001.
4. Donald H.McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002.
5. G.W.Ticehurst and A.J.Veal, Business Research Methods, Longman, 1999.
6. Ranjit Kumar, Research Methodology, Sage Publications, London, New Delhi, 1999.
7. Raymond-Alain Thie'tart, *et.al.,* Doing Management Research, Sage Publications, London, 1999.

Faculty of Technology (**Approved in 11th AC 05.01.2008**) **ITEM NO. FT 11.07(b)**

FT1916 FRICTION IN TEXTILES L T P C
3 0 0 3

Aim

To impart adequate knowledge on friction in textiles for carrying out research work in the relevant field effectively.

UNIT I INTRODUCTION TO FRICTION 9

Definition, Ammontons law of friction, Adhesion-shearing mechanism, Concept of static friction, kinetic friction. Frictional parameters – frictional force, normal load, coefficient of friction. Theory of friction and lubrication. Theories of friction in textiles – Lincoln's law of friction. Methods of measurement of friction in textile materials – Capstan method, Howell's method, Lord's method, Twist-friction method, Fibre pull-out method.

UNIT II FIBRE FRICTION 9

Importance of fibre friction, fibre-to-fibre and fibre-to-metal friction. Factors affecting fibre friction: fibre parameters – fibre structure, length, fineness, crimp, finish, polymer type. Operational parameters – normal load, sliding speed, area of contact, temperature, humidity. Fibre friction in relation to chemical treatment – scouring, dyeing, softening, lubrication. Effect of fibre friction on fibre processing, waste generation and yarn quality.

UNIT III YARN FRICTION 9

Importance of yarn friction, Yarn-to-yarn and yarn-to-metal friction, Factors influencing yarn friction – fibre type, yarn diameter, twist, unevenness, surface roughness, yarn structure (spinning method), pretension, sliding speed, contact geometry. Effect of lubrication, mercerization, softening and dyeing on yarn friction. Effect of yarn friction on its performance in winding, weaving and knitting.

UNIT IV FABRIC FRICTION 9

Overview of fabric friction, Fabric-to-fabric and fabric-to-metal friction. Effect of fibre and yarn parameters on fabric friction. Fabric friction in relation to weave, sett, yarn crimp, sliding speed, normal load, contact geometry. Effect of lubrication, coating, dyeing and softening on fabric friction. Measurement of fabric friction – Flat bed method, Inclined Plane method, KES-F method. Effect of fabric friction on hand value, comfort, wear, etc.

UNIT V ROLE OF FRICTION IN SEWING 9

Role of friction in fabric sewing – interaction and interplay of sewing thread, needle and fabric. Sewing speed, friction and needle heat, needle breakage, fabric damage / melting, hole formation, sewing thread fusion / damage. Effect of needle type, thread type, fabric type, set, thickness, surface roughness, treatment on sewing performance. Measurement of needle-penetration force in normal wovens and nonwovens. Sewing of speciality fabrics.

Total : 45 Hours

REFERENCES

1. Hong J. and Jayaraman S., Friction in Textiles, Textile Progress, Vol.34, No.1/2, Textile Institute, UK, 2003.
2. Howell H.G., Mieszkis K.W. and Tabor D., Friction in Textiles, Butterworths Scientific Publications, London, 1957.
3. Morton W.E. and Hearle J.W.S., Physical Properties of Textile Fibres, Textile Institute, UK, 1993.

FT 1917 ADVANCED CARBOHYDRATE CHEMISTRY 3 0 0 3

UNIT I INTRODUCTION OF CARBOHYDRATES 7

Introduction to carbohydrate chemistry; The glycosidic linkage of saccharides, molecular structure, geometry of the glycosidic linkage in di, oligo and poly saccharides, disorder-order transistions in polysaccharides; Solution to gel transformations; The crystal structure of polysaccharide; Plant polysaccharides; Modified and unmodified starches; Colloidal and polymeric chemistry of starches. Natural products related to and containing mono, oligio and poly saccharides.

UNIT II CLASSIFICATION AND DESCRIPTION OF MONOSACCHARIES, DISACCHARIDES, OLIGOSACCHARIDES, POLYSACCHARIDES 10

Monosaccharides – Configuration, ring structure, conformation, nomenclature; Glycosidic bond formation, types of anomeric leaving groups and their function, interconversion between different leaving groups; Protecting groups used in carbohydrates and their manipulations.

UNIT III CARBOHYDRATE CHEMISTRY 10

Configuration and conformational analysis of mono and disaccharides. Hudson's rule of isorotations and Lactone rule; Reactions of sugars including their actions with acids and bases; Esters, ethers and acetals of sugars; Anhydro-sugar, branched chain sugar, unsaturated sugar, deoxy sugar and polyamine sugar; Reactions carbohydrates at C-1, chemical modifications at C-2, C-3, C-4 and C-5; Chemical tests and quantitative methods for analyzing carbohydrates; Polysaccharide structural investigation and group analysis; Barry and Smith degradation; Molecular weight determination of Amylose and amylopectin, cellulose, hemicellulose, glycogen and inulin; Sulphated polysaccharides and marine algal polysaccharides.

UNIT IV SYNTHESIS OF CARBOHYDRATES 9

The synthesis and reactions of monosaccharides and oligosaccharides for biological and medicinal applications. Modern methods for the assembly of oligosaccharides, the attachment of oligosaccharides to proteins and other macromolecules, programmable synthesis of oligosaccharides, design and production of oligosaccharide libraries, carbohydrate-based antibiotics, glycogen and glycosaminoglycans, structures and function of glycoproteins.

UNIT V BIOSYNTHESIS OF CARBOHYDRATES 9

Mechanisms involved in the biosynthesis of polysaccharides – The enzymes of the Leloir pathway and of the non-Leloir pathway. The carbohydrate – directed enzymes – starch degrading enzymes, cellulose degrading enzymes, pectic enzymes. Biotechnology of oligosaccharides and polysaccharides. Applications of the glycosidic and other sugar directed enzymes in synthetic organic chemistry – aldolases, glycosyl transferase and glycosidases.

TEXT BOOKS AND REFERENCES

1. Jerry March, "Advanced organic chemistry, Reactions, mechanisms and structure, 3rd Ed. Reprinted' Wiley Eastern, New Delhi, 1991.
2. I.L. Finar, "Organic Chemistry", Vol.1 and 2, Fifth Edition, Reprinted ELBS Ed., New Delhi, 1991.
3. John F. Kennedy, "Carbohydrate Chemistry", Oxford University Press, 1990.
4. Peter M. Collins and Robert J. Ferrier, "Monosaccharides: Their Chemistry and Their Role in Natural Products", John Wiley and Sons, 1995.
5. Chi-Huey Wong and George M. Whitesides, "Enzymes In Synthetic Organics Chemistry", Elsevier Science, 1995.
6. Derek Horton, "Advances in Carbohydrate Chemistry and Biochemistry", Vol. 45 to 53, Academic Press, Volumes 45-53, 2002.
7. A. Varki et al., "Essentials of Glycobiology", Cold Spring Harbor Lab Press, 1999.

FT 1918 GAIT ANALYSIS 3 0 0 3

UNIT I ANATOMY OF HUMAN FOOT 6

Basic anatomical terms; Reference planes of limb motion; limb movements; motion of joints; bones of pelvis and legs; joints and ligaments; muscles and tendos.

UNIT II BIOMECHXNICS 4

Force; Moments of Force; Kinetics and Kinematics; Work, Energy and Power.

UNIT III NORMAL GAIT 12

Force Platforms; Mechanical Analysis; Mathematical Modelling; Terminology used in Gait Analysis; Gait cycle timing; Foot Placement; Cadence, Cycle time and Speed; Outline of Gait cycle; Gait cycle in detail; Ground Reaction Forces; Energy Transfers; Determinants of Gait.

UNIT IV ABNORMALITY OF GAIT 11

Specific Gait abnormalities; Functional leg length discrepancy; Abnormal Hip rotation; Excessive Knee Flexion; Excessive Knee Extension; Abnormal Foot Contact; Abnormal foot Rotation; Abnormal Walking Base; Common Pathologies affecting Gait.

UNIT V METHODS OF GAIT ANALYSIS 12

Visual Gait Analysis; General gait Parameters; Motion Measurement systems; Electrogoniometers; Pressure beneath the foot; Mapping Systems; Electromyography; Energy Consumption; Force Platforms.

TOTAL : 45 PERIODS

REFERENCES

1. Journals of : (a) Biomechanics; (b) Biomedical Engineering; (c) Gait and Posture; (d) Clinical Biomechanics.
2. Gait Analysis – an Introduction; Michael W Whittle, Butterworth Heinemann Publications.

Faculty of Technology

FT1919 PROTECTIVE CLOTHING FOR HAZARDOUS ENVIRONMENT

3 0 0 3

UNIT I FIBRE STRUCTURE AND GEOMETRY 5

Geometrical characterization of single fibers; basic parameters for porous media; characterization of fibrous materials; mathematical descriptions of the anisotropy of a fibrous material; pore distribution in a fibrous material; torbuosity distributions in a fibrous material; structural analysis of fibrous materials with special fiber orientations.

UNIT II MOISTURE IN TEXTILES 10

Surface tension, wetting and wicking- introduction, wetting and wicking, adhesive forces and interactions across interfaces; rate of change of moisture content; wetting phenomena in fibrous materials- introduction, surface tension, curvature effects of surfaces; capillarity; interactions between liquid and fibrous materials- introduction, fundamentals, complete wetting of curved surfaces, liquid spreading dynamics on a solid surface.

UNIT III HEAT –MOISTURE INTERACTIONS 10

Thermal conduction and moisture diffusion in fibrous materials- introduction, thermal conduction analysis, moisture diffusion; phase change in fabrics- introduction, effect of fabric physical properties on the condensation/evaporation process; heat-moisture interactions and phase change in fibrous material-introduction, moisture regain and equilibrium relationships, sorption and condensation, mass and heat transport processes, modeling of coupled heat and moisture transport, consequences of interactions between heat and moisture.

UNIT IV CHEMICAL PROTECTIVE CLOTHING 15

Introduction; protection from chemical hazards; design of protective clothing- introduction, functional design process; chemical protective clothing- introduction, chemical protective clothing materials, barrier effectiveness of chemical protective clothing, performance evaluation of chemical protective clothing, human exposure assessment, decontamination and reuse; refurbishment factors- chemical, thermal and mechanical energies.

UNIT V THERMOREGULATION AND COMFORT 5

Introduction; structure of skin; heat exchange at the skin surface; moisture exchange at the skin surface; sensation and comfort; modeling human thermal regulation and comfort.

REFERENCES:

1. Slater K., Textile Progress “Comfort properties of textiles”, A review published by the Textile Institute, Vol. 9/4, 1977. ISSN: 0040-5167.
2. Hearle J.W.S and Peters R.H., “Moisture in Textiles”, Butterworths Scientific Publications, Manchestor, 1960.
3. Pan N and Gibson P., “Thermal and moisture transport in fibrous materials”, Woodhead Publishing limited and CRC press LLC, ISBN-13:978-1-84569-057-1.
4. Mastura Raheel., “Protective Clothing Systems and materials”, Marcel Dekker, Inc. NewYork. Basel. HongKong 1994, ISBN: 0-8247-9118-5.

Faculty of Technology

FT1920 FUZZY CONTROL IN CHEMICAL PROCESSES

UNIT I FUZZY SYSTEM

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Member ship function, knowledge base, Decision making logic, Optimization of Membership function.

UNIT II FUZZY CONTROL

Introduction to fuzzy logic modeling and control, Design of Fussy Controllers, Structure of fuzzy controller, Table base controller, Input-output mapping, Takagi – Sugeno type controller, Mamdani’s fuzzy controller.

UNIT III FUZZY CONTROL FOR NONLINEAR SYSTEMS

Fuzzy modeling and control scheme for nonlinear system. Self organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT IV DESIGN OF FUZZY CONTROLLER USING MATLAB

Implementation of fuzzy logic controller using MATLAB Fuzzy logic toolbox. Stability analysis of fuzzy control systems.

UNIT V APPLICATIONS

Case study – Liquid level system. Separation Processes, Distillation Column, Fluid Catalytic Cracking Unit, Reaction System.

REFERENCES

1. Timothy J. Rose, 'Fuzzy logic with Engineering Applications', Tata McGraw Hill, 1997.
2. Driankov, Hellendroon, 'Introduction to Fuzzy Control', Narosa Publishers, 1996.
3. Zimmerman H.J. 'Fuzzy set theory and its applications', Kluwer Academic Publishers, 1994.
4. Klir G.J. & Folger T.A. 'Fuzzy sets, Uncertainty and Information', Prentice Hall, 1993.
5. MATLAB – Fuzzy logic Toolbox Version 2.0 Reference Manual, 1999.
6. Ronald R. Yager, 'Essential of Fuzzy Modeling and Control', Academic Publishers, 1996.

FT 1921 ADVANCES IN MOLECULAR PATHOGENESIS 3 0 0 3

UNIT I INTRODUCTION 5

Discovery of microscope, Molecular Koch's postulates, Concepts of disease, Virulence, Pathogenic cycle, Vaccines and its historical perspective

UNIT II HOST DEFENSE AGAINST PATHOGENS AND BACTERIAL DEFENSE STRATEGIES 10

Skin, mucosa, cilia secretions, physical movements, physical and chemical barriers to bacterial colonisation, Mechanism of killing by humoral and cellular defenses, Complement, Inflammatory process, Phagocytic killing, Colonization, Adherence, Iron acquisition mechanisms, invasion and intracellular residence, Evasion of complement, phagocytes and antibody response.

UNIT III MOLECULAR MECHANISMS OF VIRULENCE 10

Virulence, Colonization factors, Microbial toxins, Secretion systems: General secretory pathway, Two-step secretion, Contact dependent secretion, Conjugal transfer system and Autotransporters.

UNIT IV CONCEPTS UNDERLYING MOLECULAR PATHOGENESIS (COMMON ENTERIC PATHOGENS) 10

Shigella: Entry, Induction of macropinocytosis, Invasion of epithelial cells, Intracellular motility and spread, Apoptotic killing of macrophages, Virulence factors involved. ***E.coli***: Enterotoxigenic *E.coli* (ETEC), labile & stable toxins, Entero-pathogenic *E.coli* (EPEC), type III secretion, Cytoskeletal changes, intimate attachment; Enterohaemerrohogic *E.coli* (EHEC), Mechanism of bloody diarrhea and Hemolytic Uremic Syndrome, Enteroaggregative *E.coli* (EAEC). **Vibrio Cholerae:** Cholera toxin, Co-regulated pili, filamentous phage, survival.

UNIT V CONCEPTS UNDERLYING MOLECULAR PATHOGENESIS (COMMON NON-ENTERIC PATHOGENS) 10

Mycobacterium tuberculosis: The Mycobacterial cell envelope, Route of entry, Uptake by macrophages, Latency and persistence, Entry into and survival in phagocytes, Immune response against MTB, MTB virulence factors, Emergence of resistance. **Influenza virus:** Intracellular stages, Neuraminidase and Haemagglutinin in entry, M1 & M2 proteins in assembly and disassembly, action of amantadine. **Plasmodium:** Lifecycle, erythrocyte stages, transport mechanism and processes to support the rapidly growing schizont, parastiparous vacuoles and knob protein transport, Antimalarials based on transport processes.

FT 1922 TECHNIQUES IN MOLECULAR PATHOGENESIS 3 0 0 3

UNIT I BIOCHEMICAL APPROACHES 10

Modern methods in cell fractionation and isolation including high resolution separation methods for carbohydrates, proteins, nucleic acids and lipids, separation of proteins and proteomics, Selective proteomics-biotinylation, Receptor/ligand affinity screens.

UNIT II IMMUNOLOGICAL APPROACHES 5

Immunofluorescence methods, Tissue histopathology, T-Cell proliferation methods, Isolation of T-cell lymphocytes, FACS, Cytokine studies-Cytokine ELISA, Cytokine induction by endotoxins.

UNIT III MOLECULAR BIOLOGY APPROACHES 10

DNA preparations for analysis, RFLP, PCR, PFGE, Ligase chain reaction, Signature tagged mutagenesis, Reporter gene technologies, Checkerboard hybridization, Fluorescence based insitu hybridization

UNIT IV STUDIES ON HOST-PATHOGEN INTERACTION 10

Virulence assays: adherence, invasion, cytopathic, cytotoxic effects, identification and molecular characterization of virulence factors, attenuated mutants, signal transduction and host responses, detection of proteases by zymography, transgenic and knock out animals.

UNIT V MODERN APPROACHES FOR EARLY DETECTION OF PATHOGENS 10

Classical approaches based on serotyping, Computational screens and use of microarrays, Enzyme/prodrug therapy for infectious diseases. Modern diagnosis based on highly conserved virulence factors, vaccines- DNA, subunit and cocktail vaccines and adjuvants.

REFERENCES

1. Abigail A.Salyers and Dixie D.whitt, “Bacterial Pathogenesis-A Molecular Approach”, 2nd edition, ASM Press, 2002.
2. Eduardo A.Groisman, “Principles of Bacterical Pathogenesis”, Academic Press, 2001.
3. Gabriel Waksman, Michael Caparon, Scott Hultgren, “Structural Biology of Bacterial Pathogenesis”, ASM Press, 2005.
4. Virginia L.Clark, Partrik M.Bavoil, “Bacterial Pathogenesis”, Vol.235 &236, Academic Press, 1997.
5. Peter Williams, Julian Ketley & George Salmond, “Methods in Microbiology- Bacterial Pathogenesis”, Vol.27, Academic Press, 1998.
6. Bruce A.McClane, Timothy A.Mietzner, “Microbial Pathogenesis”, 1st edition, Fence Creek Publishing, 1999.
7. Michael T. Madigan, John M.Martinko, “Biology of Microorganisms,” 11th edition, Pearson education, Inc., 2005.
8. Stanley R.Maloy, Valley J.Stewart, Ronald K.Taylor, “Genetic Analysis of Pathogenic Bacteria”, Cold Spring Laboratory Press, 1996.
9. Jorg Hacker, Jurgen Heesemann, “Molecular Infection Biology”, Wiley-liss, 2002.

FT9001 HUMAN FACTORS ENGINEERING 3 0 0 3

UNIT I INTRODUCTION

Concept of man – machine system – Application of human factors Engineering – Man as Sensor, Man as Information processor, Man as controller.

UNIT II HUMAN BEHVAIOUR

Human Behaviour – Individual difference – Motivation – Frustration and Conflicts – Attitudes – Learning concepts.

UNIT III ERGONOMICS

Principles of ergonomic- Application of ergonomic in a work system – Principle of motion economy – Effects of environment.

UNIT IV INFLUENCING FACTORS

Factors impending safety – Technological factor – Physiological factor – Legal factor – Administrative factors.

UNIT V HUMAN FACTOR

Personal protective equipments (different types specifications, standards, testing procedures and maintenance).

REFERENCES

1. McCormick, E.J., Human Factors in Engineering and Design, Tata McGraw- Hill, 1982.
2. Accident Prevention Manual for Industrial Operations, NSC, Chicago, 1982.

FT9002 QUANTIFICATION OF PROCESS RISKS 3 0 0 3

UNIT I

Introduction ,hazard, hazard monitoring – risk issue-Hazard assessment, Procedure, Methodology, safety audit, checklist analysis, what-if analysis safety review preliminary hazard analysis (PHA),hazard operability studies(HAZOP)

UNIT II

Application of Advanced Equipments and Instruments, Thermo Calorimetry, Differential Scanning Calorimeter (DSC), Reaction Calorimeter (RC), Thermo Gravimetric Analyzer (TGA), Accelerated Rate Calorimeter (ARC), Principles of operations, Controlling parameters, Applications, advantages.

UNIT III

Explosive Testing Deflagration Test, Detonation Test, Ignition Test, Minimum ignition energy Test, Sensitiveness Test, Impact Sensitiveness Test (BAM) and Friction Sensitiveness Test (BAM), Shock Sensitiveness Test, Card Gap Test.

UNIT IV

Fault Tree Analysis & Event Tree Analysis, Logic symbols, methodology, Minimal cut set ranking – fire explosion and toxicity index (FETI), various indices – Hazards Analysis (HAZAN) Failure Mode and Effect Analysis (FMEA) – Basic concepts of Software on Risk analysis, CISCON, FETI, ALOHA.

UNIT V

Logics of consequences analysis – Estimation – Hazard identification based on the properties of chemicals – Chemical inventory analysis – identification of hazardous processes – Estimation of source term, Gas or Vapour release, liquid release, two phase release – Heat radiation effects BLEVE, Pool fires and jet fire – Gas/ vapour dispersion – Explosion, UVCE and Flash fire Explosion – Toxic effects – Plotting the damage distances on plot plant/layout.

REFERENCES:

1. Loss prevention in process industries – Frank P. Less Butterworth – Hein UK 1990 (Vol I, II, &III).
2. Methodologies for Risk and Safety Assessment in Chemical Process Industries, Commonwealth Science Council, UK.
3. Hazop and Hazon, by Trevor A K LETT, Institute of Chemical Engineering.
4. Quantitative Risk assessment in Chemical Industries, Institute of Chemical Industries Centre for Chemical process safety.
5. Guidelines for Hazard Evaluation Procedures, Centre for Chemical Process safety, AICHE 1982.

FT9003 COMPUTER AIDED TECHNIQUES FOR SAFETY ENGINEERING

UNIT 1 RISK ANALYSIS QUALIFICATION AND SOFTWARES

Fault Tree Analysis and Event Tree Analysis, Logic symbols, methodology, minimal cut set ranking – fire explosion and toxicity index(FETI), various indices – Hazard analysis (HAZAN) – Failure Mode and Effect Analysis(FMEA) – Basic concepts of software on Risk analysis, CISCON, FETI, ALOHA

UNIT 2 CONSEQUENCES ANALYSIS

Logics of consequences analysis – Estimation – Hazard identification based on the properties of Chemical inventory analysis – identification of hazardous processes – Estimation of source term, Gas or vapour release, liquid release, two phase release – Heat radiation effects, BLEVE, Pool fires and Jet fire – Gas/vapour dispersion – Explosion, UVCE and Flash fire, Explosion effects and confined explosion – Toxic effects – Plotting the damage distances on plot plant/layout.

UNIT 3 HAZARD, RISK ISSUES AND HAZARD ASSESSMENT

Introduction, hazard, hazard monitoring – risk issue – hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, preliminary hazard analysis (PHA), hazard operability studies (HAZOP).

UNIT 4 INSTRUMENTATION I

Applications of Advanced Equipments and Instruments, Thermo Calorimetry, Differential Scanning Calorimeter (DSC), Thermo Gravimetric Analyzer (TGA), Accelerated Rate Calorimeter (ARC), Principles of operations, Controlling parameters, Applications, advantages.

UNIT 5 INSTRUMENTATION II

Explosive Testing, Deflagration Test, Detonation Test, Ignition Test, Minimum ignition energy Test, Sensitiveness Test, Impact Sensitiveness Test (BAM) and Friction Sensitiveness Test (BAM), Shock Sensitiveness Test, Card Gap Test.

REFERENCES

1. Loss Prevention in Process Industries – Frank P. Less Butterworth – Hein UK 1990 (Vol. I, II, & III)
2. Methodologies for Risk and safety Assessment in Chemical Process Industries, Commonwealth Science Council, UK.
3. Hazop and Hazon, by Trevor A Klett, Institute of Chemical Engineering.
4. Quantitative Risk assessment in Chemical Industries, Institute of Chemical Industries, Centre for Chemical process safety.
5. Guidelines for Hazard Evaluation Procedures, Centre for Chemical Process safety, AICHE 1992.

FT9004 PREDICTION AND PRINCIPLES OF PROTEIN CONFORMATION 3 0 0 3

UNIT I CONCEPTS AND MODELS IN STEREOCHEMISTRY

Molecular Representative: Wedge, Fisher, Newman and Saw-Horse formulae. Optical activity: Plane polarized light interaction with molecules, optical rotation and specific rotation. Symmetry. Chiral molecules. Relationship between chirality, symmetry and molecular characteristics .DL and RS configuration of asymmetric and dissymmetric molecules. Cahn- Ingold-Prelog rules.

UNIT II STEREOCHEMISTRY OF BIOMACROMOLECULES

Isomerism and stereoisomerism. Structure, nomenclature and biological properties of Enantiomers.Carbhydrate Chemistry: Compounds with two or more stereocentres Interconversion of stereoisomer: Racemic modification and thermodynamic properties conformation of acyclic and cyclic systems: stereospecific and stereo selective reactions.

UNIT III CONFORMATIONAL ENGERGIES AND POTENTIAL FUNCTION

Hard sphere model, non-bonded potential functions, electrostatic energy, induced dipole interactions, concept of a dielectric on the molecular level, polymer-solvent interactions semiemprical quantum mechanical calculations, hydrogen bond potential functions, bond angle and bond length distortion potential functions, torsional potential functions conformation entropy.

UNIT IV CONFORMATIONAL CHANGES IN PROTEINS

Possible methods of conformational changes in proteins, solvent dependant conformation changes in proteins, stabilization energies on protein conformation mechanism of conformational changes physico-chemical properties relate to conformational changes in proteins.

UNIT V TECHNIQUES INVOLVED IN DETERMINING THE CONFORMATIONAL CHANGES

Optical rotation dispersion, circular dichroism, Polarimeter, nuclear magnetic resonance, infra red, photoelectron, electron paramagnetic resonance and surface plasmon resonance spectroscopy. atomic force microscopy, x-ray diffraction, thermal analysis mass spectrometry electrophoretic techniques and quartz crystal microbalance.

REFERENCES:

1. Nasipuri D, Stereochemistry of organic Compounds: Principles and Applications, 1994, New Age Publishers.
2. Kalsi P.S, Stereochemistry Conformation and Mechanism, 2005 New Age Publishers
3. Hopfinger A.J, Conformation Properties of Macromolecules, 1973, Academic Press Publishers.
4. Gerald D Fasman, Prediction of Protein structure and the Principles of Protein Conformation989, Springer Publishers.
5. Vladimir N Uversky, Perminakov E A, Methods in Protein Structure and Stability Analysis: Conformational Analysis, Size, Shape and Surface of Protein Molecules, 2007, Nova Publishers

Faculty of Technology

FT 9006 MICROSCALE AND NANOSCALE HEAT TRANSFER 3 0 0 3

AIM

This course aims to introduce heat and fluid flow phenomena in micro channel and nanochannel; it will enable the students to understand the various modes of micro scale abd nanoscale heat transfer part from these thermal transport phenomena such as phase change, single and two-phase flows, and combined mode heat transfer are also imported in many of the engineering applications in the field of heat transfer and fluid dynamics.

OBJECTIVE

To understand the basic concept of Micro channel and nanochannel heat transfer

UNIT I MICROSCALE HEAT TRANSFER 9

Conduction atr the microscale – Thermal conductivity models – Boltzmann equation and phonon transport –Measurement of heat conduction in the micro scale – Convective heat transfer in micro tubes and channels: thermodynamics considerations, continuum, single –phase forced convection in microchannels, nonconventional analysis methods, boiling and two-phase flow, condensation in microchannels.

UNIT II NANOSCALE THERMAL PHENOMENA 9

Introduction –Nanoparticles and nanofluids – Measurements in nanofluids:thermal conductivity,viscosity measurement, surface tension, -theretical investigations: molecular dynamics simulation, Specaial topics in thermal phenomena :matural convection under various heating conditions, mixing effect due to Brownian motion,microconvection in nanofluids.

UNIT III NANOSCALE ENERGY TRANSPORT AND CONVERSION 9

Mode of energy transport, Phonon Boltzmann Transport Equation, Nonlinear heat and mass transfer in nanoscale, Quasi-ballistic thermal transport .Brownian motion of the particles, molecular-level layering of the liquid at the liquid/particles interface, nature of heat transport in the nanoparticles, effects of nanoparticles clustering.

UNIT IV NANOSCALE HEAT TRANSFER 9

Nanofluids heat transfer: single-phase convection and pool and flow boiling applications. Flow and heat transfer characteristic in the laminar and turbulent regimes, natural and forced convection cooling, nuclear boiling and critical heat flux and post-CHF measurements.

UNIT V APPLICATIONS OF NANOSCALE HEAT TRANSFER 9

Nano fluid application: electronics cooling, vehicle cooling, fuel cell cooling ,transformer cooling ,nuclear systems cooling, and space systems cooling, drilling ,lubrication thermal storage, quenching ,and biomedical application.

REFERENCES:

1. C.B. Sobhan,G.P Perterson, Microscale and Nanoscale Heat Transfer –Fundamentals and Engineering APPLICATION, Taylor and FRANCIS/crc, 2008
2. K.,Srinivas, ,G.,Dongqing,L.,Stephene,C., and Micheal R.K., Heat Transfer and Fluid Flow in Mini channels and Micro channels ,First Edition, Elsevier, 2005.
3. Chen,G.,Nanoscalae Energy Transport and Conversion, Oxford University Press,2005.
4. Mohamed Gad-el-Hak (ed.),The MEMS Handbook, Second Edition, CRC Press,2005
5. Gang Chen"Nanoscale Energy Transport and Conversion: A parallel treatment of Eleectrons, Molecules, Phonons and Photons" Oxford University Press,2005

Faculty of Technology **(Approved in 16th AC[Ad hoc] 02.12.2010)** **ITEM NO. FT 16.02(1)**

FT9008 LEATHER PRODUCT DESIGN METHODOLOGY
(Special Elective)

UNIT I HISTORY OF DESIGN 5

History of art and architecture and its influences in product design, History of garments, textiles and costumes , History of personal accessories, History of footwear and leather goods, Relevance of personal accessories in respect of sociological status, Visual appeal and Vablen's conspicuous consumption, Trickle down theory and its relevance in product history.

UNIT II ELEMENTS OF DESIGN 10

Elements and theories of design, Application of the basic elements of design, Ergonomics and interactive scenario of the design elements, Applications of the elements in the relevance of space and demography, Elements of design and its application in socio psychology.

UNIT III DESIGN METHODOLOGY 10

The golden rule in nature and importance of it in design, Gastolt's law and its importance in design, Semiotics in design, Brain storming method of idea generation, Understanding the consumer need and demand, Concept of space and patterns in nature, Product usage and its categories, Product mix and innovation, Design process for accessories, Types, categories and usage of footwear and leather goods.

UNIT IV FASHION TREND AND FORECAST ANALYSIS 10

Definition and en tomology of fashion, trend, style and elements of trend direction, Types of trend direction review process, Application micro and macro trend directions, Importance of soil, Economical, Political and Psychological influences in trend direction, Development of forecast and understanding of styling, Discussions on various trend agencies and periodicals, Understanding the trends in accessories.

UNIT V LEATHER PRODUCT DESIGN PROCESS 10

Market and category research, Trend analysis, Concept development, Client analysis, Material selection, Color selection and functionality of the product, Brainstorming and idea generation, Design development and basic illustrations, Fine tuning the basic designs to create the collection, development of the prototype.

Total No. of Hours: 45
Total No.of Credits: 3

REFERENCES:

1. Mike Baxter, Product Design, CRC Press, Florida, USA, 1988.
2. John Kris Jones, Design methods, John Wiley and sons, New York, 1992.
3. Evelyn L. Brannon, Fashion Forecasting (2nd Edition), Paperback from Fairchild Pubns, 2010.
4. Philip Kotler, Gary Armstrong, and Peggy H. Cunningham, Principles of Marketing, Seventh Canadian Edition, 2010.

Faculty of Technology **(Approved in 16th AC[Ad hoc] 02.12.2010)** **ITEM NO. FT 16.02(2)**

FT9009 PEDORTHICS IN FOOTWEAR
(Special Elective)

UNIT I INTRODUCTION 5

Pedorthics – Role of Pedorthist – Pedorthic evaluation – Patient management - implementation and Practice management.

UNIT II FOOT DEFORMITIES AND LOCOMOTION 10

Descriptive knowledge on High arches, Flat feet, Forefoot varus, Calluses, Plantar fascitis, Metatarsalgia, Mortons neuroma, Hallux valgus, Hallux Rigidus, Hammer or Claw toes, Heel spur, Talgia, Frequent ankle sprains. Gait analysis-gait cycle, Gait patterns. Types of forcesfriction, moments, ground reaction force and muscle activity.

UNIT III FOOT ORTHOSES 10

Orthoses; Raw material- Kind of foot orthoses - Fabrication techniques and Finishing. Clinical management.

UNIT IV FOOT COMPLICATIONS AND LIFESTYLE DISEASES 7

Enumeration of Lifestyle diseases such as Diabetes, Obesity etc; Foot related complications; Risk levels of foot ; Foot characteristics – low risk to high risk; Principles of therapeutic footwear and Bio-mechanical principles in design and development of footwear.

UNIT V CORRECTIVE FOOTWEAR FABRICATION TECHNOLOGY 13

Overview-Footwear modifications - Heel modifications - Heel and Sole wedges - Customization of fit parameters – Stretching – Widening – Lengthening - Internal volume changes - Rocker bottom - Facilitation of entry and closure - Alterations including rebuilding, relasting, Shoe repair and shoe refurbishing.

TOTAL : 45 PERIODS
Total No. of Credits: 3

REFERENCES:

1. D.J.Morton, The Human Foot, Hafner Publishing Co, New York, London, 1964.
2. C A Edwards, Orthopaedic shoe Technology, Precision Printing Co., Indiana, 1981
3. Micheal W Whittle, "Gait Analysis: An introduction," Butterwolrth-Heinemann Publication.
4. J.H. Thornton, Text book of Footwear Manufacture-National trade Press Ltd, London, 1970.

Faculty of Technology **(Approved in 16th AC[Ad hoc] 02.12.2010)** **ITEM NO. FT 16.02(3)**

FT9010 MEMBRANE TECHNOLOGY IN RENAL APPLICATIONS L T P C
3 0 0 3

AIM

To know the basic concepts of membrane separation techniques considered as a strategic element in manufacturing technology for present and future products in the chemical industry, in general and for medical application, such as kidney dialysis in particular.

OBJECTIVES

- The students get knowledge on development and modelling of hollow fibre dialysers and include both theoretical and applied issues

UNIT I **7**

Overview of Membrane Science and Technology Introduction- Definition Classification of membrane Separation Processes-Historical Development of Membranes-Types of Membranes-Membrane Processes

UNIT II **9**

Membrane separation Processes: Dialysis. Hemodialysis, Gas permeation process, Introduction to types of flow in gas permeation: Hollow-fiber separation assembly, reverse osmosis. Application of reverse osmosis. Introduction nano filtration process, ultra filtration process and Microfiltration process

UNIT III **9**

Functions of Human kidney

Kidney function anatomy-Glomerular filtration- Tubular function-Effect of disordered renal function.-causes, Treatment. Biochemical consequences of renal failure-Uremic toxins.

UNIT IV **9**

Membrane Assist Devices:

Artificial kidney, Dialysis action, Hemodialyser unit, Membrane dialysis, Portable dialyzer. Monitoring and functional parameters. Dialysis membranes-Types-Biocompatibility-Newer membranes for dialysis

UNIT V **11**

Medical Applications of Membrane

Kidney filtration, artificial waste removal methods, hemodialysis equation for artificial kidney and middle molecule hypothesis. Hemodialysers, mass transfer analysis. Regeneration of dialysate, membrane configurations, mechanism of operation wearable artificial kidney machine, separation of antigen from blood in ESRD patient. Membrane less dialysis.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Judson kind, "Separation processes", Mc Graw Hill chemical engineering series. II edition.
2. Philip.A.Schweiter, "Hand book of separation techniques for chemical engineering", Mc.Graw Hill. III edition.
3. Bronzino Joseph, "Hand book of biomedical engineering", CRC.2 sub edition-1999.
4. John T.Daugirdas, Peter G. Blake, Todd S. Ing," Hand Book of Dialysis", Lippincott Williams & Wilkins, Wolters Kluwer Publishers, 2007.

REFERENCES

1. J.D. Seader., Ernest J. Henly, "Separation Process Principles", John Wiley & Sons, Inc.
2. Richard W. Baker, "Membrane Technology and Applications" John Wiley & Sonc, Ltd, II Edition, 2004.
3. Pankaj Vadgama, "Surface and Interfaces for Biomaterials", CRC Publishers, 2005.
4. Walter H. Horl, Karl M. Koch, Robert M. Lindsay, Claudio Ronco, James.F. Winchester, "Replacement of Renal Function by Dialysis", Kluwer academic publishers, 5th Edition, 2004.

Faculty of Technology **(Approved in 17th AC[Ad hoc] 27.04.2012)** **ITEM NO. FT 17.01**

FT9011	**ELECTROCHEMICAL PROCESS ENGINEERING FOR CHEMICAL ENGINEERS**	**L T P C 3 0 0 3**

UNIT I Introduction of Electrochemical Engineering **4**

Industrial importance of Electrolytic Processes, Basic concepts and definitions, Criteria for reactor Performance, Electrochemical and Catalytic Reactions and Reactors.

UNIT II Aspects of Mass and Heat Transfer and the Energetic of Electrolytic cell Systems **12**

Basic aspects of Fluid dynamics, Mass transfer – Mass flux in a fully developed Turbulent regime, Entrance and Exit effects, Obtaining numerical Values of Mass transfer coefficient by calculation and experiment, Mass transfer in two-phase flow, Energetic and Energy Balances.

UNIT III Rate Processes and Reaction Models **8**

Rate Processes, Kinetics of Elementary Reactions, Reaction mechanism and rate laws, Transition state theory, Derivation of Kinetic relationships, Reaction models.

UNIT IV Reaction models **6**

General considerations, Batch reactor and Continuous Reactor.

UNIT V Electrolytic Reactor Design, Selection and Scale – up **15**

Electrolytic reactor designs, Electrolytic reactor selection, scale up of Electrolytic reactors, Effect of Scale – up on Mass transfer, Effect of Scale up on Current Distribution, Multiple electrode models, and Time factors.

TOTAL: 45 PERIODS

Text Book

1. Electrochemical Process Engineering, A Guide to the Design of Electrolytic Plant F. Goodridge, K. Scott, Chapters 1 to 5 only.

Faculty of Technology **(Approved in 18th AC[Ad hoc] 09.08.2014)** **ITEM NO. FT 18.04**

FT 9012 MOLECULAR BIOLOGY RELEVANT TO LEATHER TECHNOLOGY **L T P C 3 0 0 3**

UNIT I MOLECULAR CELL BIOLOGY AND ENERGETICS **9**

Types of cells, structure of cell and functions of various organelles, Functional organization at molecular level; membranes, molecular communications, cellular metabolism - generation of cellular energy, biosynthesis of macromolecules

UNIT II MICROBIAL GENETICS **9**

Basic concepts of microbial genetics; bacterial genome and functions; Gene organization and Operon; Nucleic acid sequencing, mutation and repair; Viral Genetics

UNIT III PRODUCTS OF MICROBIAL GROWTH **9**

Primary and secondary metabolism of microbes; production of commercial products: probiotics, neutraceuticals, antibiotics and vitamins from microorganisms

UNIT IV GENE MANIPULATION **9**

Basic Techniques in gene manipulation; restriction and ligation of nucleic acids; carriers of DNA molecules; Cloning strategies in prokaryotes and eukaryotes; essentials of gene manipulation; production of transgenic animals.

UNIT V ROLE OF MOLECULAR BIOLOGY IN LEATHER TECHNOLOGY **9**

Mechanism of skin putrefaction and fungal attack of wetblue and vegetable tanned leathers, effect of growth of microorganisms in skin / hide and leather, molecular tools for over production of microbial enzymes and their mechanism for leather processing.

TOTAL: 45 PERIODS

TEXTS / REFERENCES:

1. Interactive Concepts in Biochemistry by Rodney Boyer, Copyright 2002, John Wiley & Sons Publishers, Inc http://www.wiley.com/legacy/college/boyer/0470003790/index.htm
2. Biochemistry by Lubert Stryer, 5th Edition W. H. Freeman and Company, New York
3. Lehninger's Principles of Biochemistry, 4th Edn, by David L. Nelson and Michael M. Cox.
4. Principles of Gene Manipulation, Sandy B Primrose, Richard M Twyman and Robert W Old.