Syllabus

MH-201 MATHEMATICS III (4 0 0) 4

(Common for all branches except ECE)

Fourier Series, Half range Series , Fourier- sine and cosine transformations, Z-transforms and Inverse Z- transforms – Properties – Applications to Difference equations. **Partial Differential Equations**: Method of separation of variables for Wave, Heat and Laplace equations. **Complex Variables:** Analytic function – Cauchy Riemann equations, line integrals , Cauchy's theorem, Cauchy's integral formula – Taylor's and Laurent's series, Residue theorem, application of Residue theorem, bilinear and conformal mapping.

Text Books:

1. R. K. Jain and S. R. K. Iyengar: Advanced Engineering Mathematics, Narosa Publishing House, 2002
2. Erwyn Kreyszig: Advanced Engineering Mathematics, John Wiley, 8th Edition.

Reference Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publications, 2003.

BT-201 CELL BIOLOGY (4 0 0) 4

Cell Theory and Diversity, Cell surface, Membrane structure and organization, Intracellular organelle structure and function, Nucleus System, Chromosomes and heredity, Mutations, Cell growth, division and reproduction, Concepts of cell ageing and cell signalling.

Text Books:

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Dennis Bray, Karen Hopkin, Keith Roberts, Peter Walter: Essential Cell Biology, Garland Science/ Tyler & Francis Publishers, 2nd Edition, 2003.
2. Rastogi S. C: Cell Biology, New age International publishers, 3rd Edition, 2005.

Reference Books:

1. Thomas D. Pollard, William C. Earnshaw and Jennifer Lippincott-Schwartz: Cell Biology: With Student Consult Online Access, Saunders College Publishing, 2nd Edition, 2007.

BT-202 BIOCHEMISTRY

(4 0 0) 4

Introduction to Biochemistry, Amino acids and Peptides, The three dimensional structure of Proteins, Enzymes and Enzyme Kinetics, Nucleic acids, Principles of Bioenergetics, Carbohydrates, Lipids, Glycolysis pathways.

Text Books:

1. David L. Nelson and Michael M. Cox: Lehninger Principles of Biochemistry, Palgrave Macmillan, Freeman, Low Price Edition, 4th Edition, 2007.
2. Mary K. Campbell and Shawn O. Farrell: Biochemistry, Thomson Brooks/Cole, Indian Edition, 5th Edition, 2007.

Reference Books:

1. Robert K. Murray, Daryl K. Granner and Victor W. Rodwell: Harper's Illustrated Biochemistry, McGraw Hill Lange, International Edition, 27th Edition, 2006.
2. Lubert Stryer, Jeremy M. Berg, and John L. Tymoczko: Biochemistry, W. H. Freeman & Co, 5th Edition, 2002.

BT-203 MICROBIOLOGY

(4 0 0) 4

Scope and History of Microbiology, Characterization, Classification, Identification and Examination of Microorganisms, Bacteria, Fungi, Protozoa and Viruses, Cultivation of Bacteria, Bacterial Genetics, Fungi, Algae, and Protozoa, Viruses, Control of Microorganisms, Introduction to Applied Microbiology.

Text Books:

1. Michael J. Pelczar, Jr., E.C.S. Chan, Noel R. Krieg: Microbiology, Tata McGraw Hill, 5th Edition, 2006.
2. John L. Ingraham, Catherine A. Ingraham: Introduction to Microbiology, A case History Approach, Thomson Brooks/Cole, 3rdEdition, 2004.

Reference Books:

3. Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton: Prescott, Harley, and Klein's Microbiology, McGraw Hill Higher Education, International Edition, 7th Edition, 2007.

CH-208 FLUID MECHANICS AND HEAT TRANSFER (4 0 0) 4

Fluid Mechanics: Unit systems – Fluid Statics and Its Applications – Fluid Flow Phenomena – Basic Equations of Fluid Flow – Incompressible Flow In Pipes and Channels – Flow of Compressible Fluids – Flow Past Immersed Bodies – Transportation and Metering of Fluids.

Heat Transfer: Heat Transfer by Conduction in Solids – Principles of Heat Flow in fluids – Heat Transfer to Fluids without Phase Change – Heat Transfer to Fluids with Phase Change – Heat-Exchange Equipment, Heat transfer by Radiation

Text Books:

1. Warren L. McCabe, Jullian C. Smith, Peter Harriott: Unit Operations of Chemical Engineering, McGraw Hill, International Edition, 7th Edition, 2005.

Reference Books:

1. Coulson J. M and Richardson J. F: Chemical Engineering, Elsevier, Volume I - 6th Edition, 2000 and Volume II – 5th 2003.

2. Frank P. Incropera: Fundamentals of Heat and Mass Transfer, John Wiley & sons, 6th Rev Edition, 2007.

BT-204 BIOCHEMISTRY LABORATORY (0 0 3) 2

Quantitative reactions of Carbohydrates (Starch, Cellulose, etc…) including preparation of derivatives and identification of unknown Carbohydrates; Identification of Amino acids including unknown Amino acids; General reactions of proteins (Albumin, Globulin, Casein, etc…); Colour reactions of Cholesterol; Analysis of Urine – Tests for Uric acid, Test for Creatinine; Analysis of Urine for abnormal Constitutions; Estimation of Glucose in Urine; Estimation of Creatinine in Urine; Estimation of Urea in Urine by Urease method; Estimation of glucose in blood; Estimation of Urea in Blood; Estimation of Serum cholesterol.

BT-205 MICROBIOLOGY LABORATORY (0 0 3) 2

Sterilization techniques (lecture/demonstrations); Preparation of culture media – Broth – Agar; Culturing of Microorganisms – Pure culture techniques – Streak plate – Pour plate; Isolation and preservation of Bacterial culture; Identification of microorganisms – Staining techniques; 6.Quantitation of microorganisms – Counting microscopy – Nephelometry / Turbidimetry – Total N or dry weight – Serial dilution plating; Applied microbiology – Sewage and Soil samples analysis – Milk and Fermented Food.

CH-209 FLUID MECHANICS AND HEAT TRANSFER LAB (0 0 3) 2

Fluid Mechanics Laboratory: Measurement of viscosity and surface tension of liquids – Reynolds Experiment – Verification of Bernoulli's Principle – Friction in flow through smooth and rough pipes – Friction in pipe fittings and valves – Terminal settling velocities in viscous medium – Flow through packed bed – Flow through fluidized bed – Calibration of Orifice and Venturi meters – Characteristics of centrifugal pump

Heat Transfer Laboratory: Electrical analogue for heat conduction – Natural Convection -Thermal Resistance in series – Heat losses from cylindrical furnace – Temperature profile in rod – Double pipe heat exchanger – Helical Coil – Heat pipe demonstration experiment – Boiling Phenomena in liquids – Heat Exchanger – Tubular Heat Exchanger – Fin Tube Heat Exchanger – Plate Heat Exchanger.

MH-251 MATHEMATICS-IV (4 0 0) 4

(Common for all branches except ECE)

Statistics and Probability: Expectation, Moments and Moment generating function, Binomial, Poisson and Normal distributions, Testing of Hypothesis – Z-t-F- Chi-square tests Correlation, regression. **Numerical Analysis**: Curve fitting (method of least squares) Lagrange, Newton and Gauss's interpolation formulae, Numerical differentiation, Numerical Integration, Solutions of Initial Value problems, Solution of algebraic and transcendental equations**Method of Frobenius series**: Bessel and Legendre functions

Text Books:

1. S. C. Gupta and V. K. Kapoor : Fundamentals of Mathematical Statistics.
2. M.K. Jain S.R.K. Iyengar and R.K.Jain: Numerical methods for Scientific and Engineering Computation
3. Erwyn Kreyszig : Advanced Engineering Mathematics

Reference Books:

1. B. S. Grewal: Higher Engineering Mathematics, Khanna Publications

BT-251 MOLECULAR BIOLOGY AND GENETICS (4 0 0) 4

Mendelian Genetics, Linkage, Genome Anatomies, Genome Replication, Initiation of Transcription, Translation I, Translation II.

Text Books:

1. David Freifelder, Molecular Biology, 2nd Edition, Narosa Publishing House, Reprint 2004
2. T.A. Brown., Genomes 2, 2nd Edition, Garland Science, 2006.
3. Strickberger M.W., Genetics, 3rd Edition, Prentice Hall India, 2007.
4. Eldon John Gardner, Michael J. Simmons, Peter Snustad D., Principles of Genetics, 8th Edition, Wiley India, Second Reprint 2007.

Reference Books:

1. Anthony J.F. Griffiths, Susan R. Wessler, Richard C. Lewontin and Sean B. Carroll, Introduction to Genetic Analysis, 9th Edition, W.H. Freeman, 2007.
2. Benjamin Lewin, Gene IX, Jones and Bartlett, 2006.

BT-252 BIOCHEMICAL THERMODYNAMICS (4 0 0) 4

Concepts in Engineering Thermodynamics, Solution Thermodynamics, Phase and Chemical Reaction Equilibria, Biochemical Thermodynamics

Text Books:

1. J.M. Smith, H.C. van Ness and M.M. Abbott, Introduction to Chemical Engineering Thermodynamics, McGraw Hill, 6th Edition, 2004.
2. Stanley I. Sandler, Chemical, Biochemical, and Engineering Thermodynamics, 4th Edition, Wiley, 2006.

Reference Books:

1. J.A Roels, Kinetics and Energetics in Biotechnology, Elsevier, 1983
2. Robert A. Alberty, Biochemical Thermodynamics: Applications of Mathematica 1st Edition, Wiley-Interscience, 2007.
3. Y.V.C Rao Chemical Engineering Thermodynamics, University Press, 2008.
4. K. V. Narayanan, Textbook of Chemical Engineering Thermodynamics, Eastern Economy Edition, 2007.

BT-253 PROCESS CALCULATIONS (4 0 0) 4

Steady-state material balances, Material balance for various unit operations, Steady-state energy balances, Introduction to unsteady-state material and energy balances.

Text Books:

1. Himmelblau, D.H, Basic Principles and Calculations in Chemical Engineering, 6th Edition, Prentice Hall India, 2003
2. Bhatt B. I and Vora S.M, Stoichiometry, 4th Edition, Tata McGraw-Hill, 2005.

Reference Books:

1. Hougen, O.A, Watson, K.M and Ragatz R.A, Chemical Processes Principles (Part-1): Material and Energy Balances, 2nd Edition, Asia Publication House, 2001.
2. Pauline M. Doran, Bioprocess Engineering Principles, Elsevier, South Asia Edition, 2005.

CH-258 MASS TRANSFER (4 0 0) 4

Mass Transfer Operations**,** Molecular Diffusion in Fluids**;** Diffusion in Solids, Mass Transfer Coefficients**,** Interphase Mass Transfer**,**Gas Absorption**,** Distillation, Liquid Extraction**,** Adsorption and Ion Exchange**,** Drying

Text Books:

1. Treyball R. E. – Mass Transfer Operations – 3rd Edition – International Student Edition McGraw Hill International, 1981.

Reference Books:

1. C. J. Geankoplis – Transport Processes and Unit Operations – 3rd Edition, Prentice Hall Inc., 1993.
2. Warren L. McCabe, Julian C. Smith and Peter Harriott – Unit Operations of Chemical Engineering, 6th Edition, McGraw Hill, Inc (2002).

BT-254 MOLECULAR BIOLOGY & GENETICS LAB (0 0 3) 2

Growth Curve of Bacteria, Preparation of Competent Cells using $Cacl_2$ and Transformation of Plasmid, Bacteriophage Titration, Isolation of Plasmid by Alkali Lysis Method, Isolation of Genomic DNA from Bacteria by High Salt Method, Nucleic acid separation by Agarose Gel Electrophoresis, DNA Elution from Agarose Gel, Miniprep by Modified Alkali Lysis Method, Isolation of Genomic DNA from Blood Cells by High Salt Method, Protein Purification and Characterization by SDS-PAGE, Operation principles of Western Blotting, Operation principles of Southern Blotting.

BT-255 INSTRUMENTAL ANALYSIS LAB (0 0 3) 2

Determination of pKa of an amino acid using UV-Vis Spectrophotometer, Estimation of Trace elements by Flame Photometry, Study of Enzyme Kinetics by UV-Vis Scanning Spectrophotometer, Application of Differential Scanning Calorimeter (DSC) in Biochemical analysis, Determination of Nucleic acid melting temperature using DSC, Operation principles of Gradient Thermocycler for Polymerase Chain Reaction, Operation principles of Microplate Reader for ELISA, Operating principles of HPLC/GLC.

CH-259 MASS TRANSFER LABORATORY (0 0 3) 2

Steam Distillation, Batch Distillation, Distillation in Packed Tower, Distillation in Plate Column, Diffusivity coefficient determination, Mutual solubility data, Tie-line data, Batch Drying, Mass Transfer in Packed Tower, Mass Transfer in Spray Tower, Ion-Exchange Apparatus, V.L.E – Data.

BT-301 BIOREACTION ENGINEERING (4 0 0) 4

Introduction, Bioreactor systems, Design of Bioreactors, Modelling of growth kinetics and design of fermentation processes, Scale-up of bioprocesses.

Text Books:

1. Bioreaction Engineering Principles , Second Edition, Jens Nielsen , John Villadsen , Gunnar Lidén, Kluwer Academics /Plenum publishers. 2002

2. Chemical Reaction Engineering; third Edition, Octave Levenspiel. A Wiley-interscience Publication .2004

Reference Books:

1. Bioprocess Engineering Principles. Paulin M. Doran. Elsevier Science & Technology Books.2006

2. Elements of Chemical Reaction Engineering, Third Edition, H. Scott Fogler. Prentice-Hall India.2006

3. Biochemical Engineering Fundamentals, Second Edition, James E. Bailey, David F. Ollis McGrawHill. 2001

BT-302 FUNDAMENTALS OF BIOPROCESS ENGINEERING (4 0 0) 4

Introduction, Sterilization, Operating considerations for bioreactors for suspension and immobilized cultures,Selection, Scale-Up, Operation, and Control of Bioreactors, Bioprocess considerations in using animal cell cultures

Text Books:

1. Bioprocess Engineering Basic Concepts 2nd Edition, Michael Shuler, Fikret Kargi. Prentice-Hall India.2006

2. Bioprocess Engineering Principles by Paulin M. Doran. Elsevier Science & Technology Books.2002

Reference Books:

1. Bioprocess Engineering: Kinetics, Mass Transport, Reactors and Gene Expression. by Wolf. R. Vieth. Wiley-Interscience Publication 2001

2. Principles of fermentation technology P F Stanbury and A Whitaker, Pergamon, press, latest edition, 2002