

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method

Reference:

- (i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
- (ii) Numerical Methods for Scientific and Engg. Computation by MKJain, lyengar and RK Jain, New Age International Publication
- (iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
- (iv) Numerical Methods using Matlab by Yang,Wiley India
- (v) Pobability and Statistics by Ravichandran ,Wiley India
- (vi) Mathematical Statistics by George R., Springer

BT- 402 – Chemical Biochemical Engg.

Unit-I Fluid Mechanics: Properties of Fluid, Forces on fluid, Pressure measurement by manometer, Hydrostatic equilibrium Newtonian and Non-Newtonian fluid, Viscosity, Equation of continuity, Laminar flow Turbulent flow, Reynolds number, Boundary layer theory.

Unit –II Bernoulli's equation, Friction losses in pipe for laminar and turbulent flow, bioprocess fluid machines, Pump valves, vacuum pump, Compressor, Power and head requirement for pump, Flow past immersed body, drag force fluidization, Pressure drop in packed bed, Fluid flow measurement, Venturi-meter, Orifice meter, Rota-meter, Pitot-tube.

Unit-III Transport phenomena in biological systems: Examples of transport of mass, Momentum and energy. Oxygen transfer by aeration and agitation, Determination of oxygen transfer coefficient by various methods. Factors affecting oxygen transfer coefficient. Momentum transfer by agitation: Determination of aerated and non aerated power broths, Heat transfer requirements of Microbial cultivation.

Unit-IV Introduction to heat transfer, different mode of heat transfer, Conduction, Convection, Radiation, Conduction, heat rate equation, Insulation, Critical radius, Conduction Through slab, Cylinder, Sphere Convection. Consecutive heat transfer, Heat transfer in Convection boundary layer and films, Natural and forced convection, Individual and overall heat transfer co-efficient, fouling factors.

Unit-V Co/counter/cross current contacting for heat transfer, heat transfer under phase change conditions, Boiling condensation. Heat exchanging equipments: shell and tube exchanger, Use of cooling coil and jacketed vessel to control temperature of reacting system evaporator.

References:

1. Stanbury P.F & Whitaker, A; Principles of Fermentation Technology
2. Bailey & Ollis; Biochemical Engineering: Fundamentals
3. Blanch HW, Clark DS; Biochemical Engineering
4. Dunn S, Constantinides A, and Moghe PV; Numerical Methods in Biomedical Engineering
5. Daniel AB and Hong; Chemical Biophysics: Quantitative Analysis of Cellular Systems (Cambridge Texts in Biomedical Engineering)
6. Lydersen BK, D'Elia NA, Nelson KL; Bioprocess Engineering,
7. Shuler ML, Kargi FL; Bioprocess Engineering: Basic Concepts
8. GALINDO; Advances in bioprocess engineering

BT- 403 – Bio-Molecule Structure & Functions

Unit –I Classification, structure and properties of carbohydrates, lipids, fatty acids, Biosynthesis of carbohydrates, lipids and amino acid.

Unit –II Structure of RNA and DNA, Histoprotein and its biochemical nature, Biological significance of histoprotein, Binding of non histoprotein material with nucleic acids and proteins, Synthetic DNA. RNA and proteins and its commercial values.

Unit-III Thermodynamic nature of biomolecules: Principles of thermodynamics. First and second laws of thermodynamics, activity coefficients and equilibrium, Biological system as non-equilibrium system, Failure of classical (closed equilibrium) thermodynamics in describing biological process.

Unit –IV Thermodynamics concepts for irreversible biological processes, Concepts of thermodynamics flux and force, Concept of entropy production, Constitutive equations: Onsager's reciprocal relations: Prigogine's principle.

Unit –V Concept of coupling in biological processes: Thermodynamics of coupled biochemical reaction, Cells as non-equilibrium stationary states, Non –equilibrium thermodynamics of passive and active transport, Prigogine-curie law: thermodynamics analysis of oxidative phosphorylation, glycolysis oscillation biological clocks and biosynthesis.

References:

1. Lehninger; Principles of Biochemistry
2. Lodish; Cell & Molecular Biology
3. Stryer; Biochemistry
4. Harper; Biochemistry
5. C. Stan Tsai; Biomacromolecules: Introduction to Structure, Function and Informatics
6. Frank H. Stephenson; Calculations for Molecular Biology and Biotechnology: A Guide to Mathematics in the Laboratory

List of Experiments (expandable):

1. Protein separation by using SDS- PAGE.
2. Analysis of Enzyme hydrolysis.
3. Spectrophotometric analysis of given biomolecules
 - a. Protein
 - b. Carbohydrate

BT- 404 – Genetics

Unit I Introduction to genetics, genes Allels and genotypes, genetic terminology Mendel's laws, Estimation of alleles, Samples of individuals, a Use of data on relatives, Gene drift., pedigree

Unit II Evidence for DNA, RNA as genetic material, Replication of DNA Transcription (Prokaryotes and Eucaryotes)

Unit III Protein synthesis, Ribosomes, Protein splicing, Regulation of mRNA synthesis, Attenuation, Translation, codon usage, inhibitors of transcription and translation, Mutation, Gene regulation, operon concept gal, lac, trp.

Unit IV Linkage between the loci –Linkage and recombination, Chromosome structure and organization in prokaryotes and eukaryotes, Linkage, crossing over and genetic mapping of chromosomes

Unit V Retroviruses, retroposons and oncogenes., and their properties, an overview of apoptosis, genetic and metabolic disorders, genetic load and counselling

References:

1. Gardner; Principles of Genetics
2. Strickberger; Principles of Genetics
3. Snusted & Simmons; Principles of Genetics
4. Benjamin Lewin; Gene I-VIII

List of Experiments (expandable):

1. Isolation and Purification of Plasmid DNA.
2. PCR study of isolated DNA.
3. To separate DNA by using Agarose Gel Electrophoresis.

BT- 405 – Metabolic Engineering

Unit-I Concept on primary process of photosynthesis, Photosystem II and I characterization, water splitting enzyme complex and evolution of O₂, Electron transport system across thylakoid membrane, dark reaction, Chloroplast DNA, Genetic regulation of chloroplast and functions.

Unit-II Function of mitochondria in eukaryotic cells, Carbohydrate metabolism and energy generation, electron transport system chain through mitochondrial membrane, Studies on physiology and biochemistry of mitochondria, Mitochondrial DNA gene regulation of mitochondria and functions.

Unit-III Nitrogen metabolism in prokaryotic and eukaryotic system, Energetic of nitrogen metabolism, Regulation of nitrogen metabolism in prokaryotes and eukaryotic cells, Concept on nif gene, Genetically regulation of nitrogen metabolism.

Unit-IV Concept of secondary metabolite, Secondary metabolite production, genetically regulation of secondary metabolites.

Unit-V Commercialization of secondary metabolite production, Modern concept on secondary metabolite production through free cell culture and tissue culture, Examples natural antioxidants (Beta –carotene and lycopene) monoterpenes, diterpenes, essential oil, anticancer compounds like taxol 10-DAB, Colchicine.

References:

1. Stephanopoulos GN, Aristos et al; Metabolic Engineering: Principles and Methodologies
2. Smolke Christina D; The Metabolic Pathway Engineering Handbook
3. Lee Sang Yup, Papoutsakis ET; Metabolic Engineering (Biotechnology and Bioprocessing Series)
4. Cortassa S, Aon MA, Iglesias et al; An Introduction to Metabolic and Cellular Engineering
5. Wendisch Volker F; Amino Acid Biosynthesis Pathways, Regulation and Metabolic Engineering (Microbiology Monographs)

List of Experiments (expandable):

1. Study of effect of steroids in signal transduction.
2. Study of interaction for ligand- receptor through Enzyme kinetics.
3. Study of citric acid production by optimization of different parameters

BT- 406 – Dot Net

UNIT I Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT II Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. **Advanced Features Of C#** Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT III Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. **Windows Forms:** All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

UNIT IV Understanding and handling controls events, **ADO.NET-** Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader **Data base controls:** Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by [Harvey Deitel](#), [Paul Deitel](#), Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. **Web Commerce Technology** Handbook by Daniel **Minoli**, Emma **Minoli** , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold ,
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Expandable):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page using ASP .Net.
12. Working with Forms using ASP .Net
13. Data Sources access through ADO.Net,
14. Working with Data readers , Transactions
15. Creating Web Application.