Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology Branch:All Branches **Semester: III**
Subject: Mathematics – III **Code: B000311(014)**
Total Theory Periods: 03 **Total Tutorial Periods: 01**
Class Tests: Two (Minimum) **Assignments: Two (Minimum)**
ESE Duration: Three Hours **Maximum Marks: 100** **Minimum Marks: 35**

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology
Branch: Plastics Engineering
Subject: Polymer Chemistry
Credit : 04
Maximum Marks: 100

Semester: III
Code: **B095312(095)**
ESE Duration: 03 Hours
Minimum Marks: 35

Course Objectives

To enable the students to understand the fundamentals of polymer, molecular weight of polymer, mechanism of and kinetics of polymerization, various techniques of polymerization, copolymerization, reactions and degradation of polymers.

UNIT-I

Basic fundamentals of chemistry related to polymers, the science of large molecules Basic concepts of polymer science: monomer & functionality, oligomer, repeating unites, polymerization, degree of polymerization, Polymer structure: Nomenclature and brief description on each classification of polymers, Molecular weight - Molecular weight averages- Molecular weight distribution, Effect of molecular weight on processing and properties, Methods of determination of different molecular weights, Thermal transition

UNIT-II

Chain and Step Polymerization: Chemistry and mechanism of Free radical polymerization, condensation polymerization, Ionic polymerization, coordination polymerization; Ziegler Natta catalyst and Ring Opening Polymerization, Role & Examples of- initiator, inhibitor, retarder, chain transfer agent, catalyst, Factors affecting polymerization.

UNIT-III

Definition of reaction rate, kinetics of addition/chain growth polymerization initiated by free radical initiator: steady state assumption, kinetics of step reaction polymerization, Chain length and degree of Polymerization – Control of molecular weight- Chain transfer, Advanced Polymerization, Techniques - Atom Transfer Radical Polymerization (ATRP), Group Transfer Polymerization, (GTP), Reversible Addition Fragmentation Termination (RAFT).

UNIT-IV

Copolymerization - Mechanism and Kinetics of free radical - Ionic copolymerization. Types of copolymers- Copolymer composition - Determination of Monomer reactivity ratios, different copolymers, random, alternating, azeotropic copolymerization, block and graft copolymers, Polymerization techniques - Bulk polymerization - Solution polymerization –Suspension, polymerization - Emulsion polymerization - Interfacial condensation.

UNIT-V

Chemical reactions of polymers:Hydrolysis, Acidolysis, Aminolysis, Hydrogenation, Addition and Substitution reactions, Cross-linking-reactions. Polymer degradation Mechanical Degradation, UV or photo-degradation, Thermal degradation, Thermo-oxidative degradation.

Course outcomes:

Upon completion of this course, the students will be able to

1. Explain fundamentals of polymer chemistry and classification of polymers
2. Explain mechanism for polymerization reactions
3. Explain polymerization methods with importance
4. Explain the fundamentals of copolymerization and special topics in polymer synthesis
5. Outline the important polymer reactions and degradation of polymer.

Text Books:

1. F.W. Billmeyer, "Textbook of Polymer Science", Wiley international publishers, 2000
2. George Odian , " Principles of polymerisation", Seymor Robert
3. V.R. Gowariker, "Polymer Science" – New Age International (P) Ltd, Publishers

Reference:

1. JM.G. Cowie, "Polymers: Chemistry and Physics of Modern Materials", Blackie, and London, 1991.
2. R.J. Young and P.Lovell, "Introduction to Polymers", 2nd Ed., Chapman & Hall, 1991.
3. Premamoy Ghosh, "Polymer Science and Technology of Plastics and Rubbers
4. Cowie; J. M. G., Polymers: Chemistry and Physics of Modern Materials, 2nd Edition, Blackie and Sons Ltd., Glasgow (1991).

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology | **Semester**: III

Branch: Plastics Engineering | **Code**: **B095313(095)**

Subject: Fundamentals of Plastics Product, Mould & Die Design

Credit : 04 | **ESE Duration:** 03 Hours

Maximum Marks: 100 | **Minimum Marks: 35**

Course Objectives

The primary objective of this course is to address the issues that are most often poorly understood and overlooked in the mould engineering process. This requires mechanical design of a mould and focuses more on the details that influence the formation of the plastic product, its quality, performance and productivity.This Course is to enable the mould designers to design the mould making process with automation of specific mould design tasks such as library of standard mouldbases and components.

UNIT-I

Orthographic Projection-Projection of solids-Sectional views and assembly drawing. Basics , Principles of mould design, Selection of materials for Moulds and Dies, Economical consideration ,Required Properties of Mould materials-Simple and Temperature stresses (Hooke's Law)-Shear Force and Bending Moment-Shear Stress and Bending Stress distribution-Theories of failure-Torsion of Shaft-Deflection of Beams-Theory of Columns- Springs- Mould springs, `O`Rings

UNIT-II

Design of Polymeric Product. Design criteria based upon product functions and geometry.Design of Plastic under static load; Design of Plastic under Dynamic load – Material selection by property assessment. Selection of appropriate Fabrication processes. Moulding considerations: Draft, radii, dimensional tolerances, wall thicknesses, ribs and bosses, inserts, Fasteners, Sink Marks, Undercuts, Flow pattern, Basic principle-Shrinkage and Post moulding shrinkage -Shrinkage calculation -linear and volumetric shrinkage, Flash lines, Weld & Melt lines – Moulded holes-Threads-Fillets-Integral Hinge-Snap fits - Product design thumb rules - Case studies on product design.

UNIT-III

Introduction of Injection Mould, Selection Requirements of Mould Material ,Mould Design Requirements ,Moulding Requirements, Selection criteria of Injection moulding machine - Shot capacity,-Plasticizing capacity-Clamping force-Max & Min Day Light -Hydraulic pressure-Direct and Indirect Clamping of Mould, Nozzle of machine & its radius, Standard Mould base., Estimation of mould cost, Calculation of Technological and Economical number of impressions-

Two Plate and Three Plate Injection Moulds ,Constructional details of Two Plate & Three-Plate Mould:, Opening& Control Devices, Runner Ejection Techniques , Comparison with Two Plate Mould & three plate mould, Double Daylight Underfeed Mould,

UNIT -IV

Feed system:

Sprue, Runner & Gate – cross section and size of runner –runner layout – balancing of runners – types of gates for various materials – cross section of gate – gate balancing. Empirical formulae ,Positioning of Gates, Mould filling patterns, Family type Mould

Guiding system:

Design of Locating ring, Guide pillar, Guide bush, Taper locator -Taper location in core and cavity plate-Ejector Guide pillar and bush, Limits-fits-tolerance in mould parts,

Ejection system:

Types of ejector grid – Ejector plate assembly – Guiding & Supporting ejector plate assembly - Types of ejection – position & critical area of ejection Pin ejection, Stripper plates, Valve ejection, Blade ejection, Air ejection, Direct Ejection, Ejection from Fixed half,calculation of support pillar requirements. Calculation of Ejection force, ejection stroke etc.

Temperaturecontrol system:

Mould Cooling : Integer type cavity and core plates cooling, angled hole systems, baffled hole systems, stepped circuit – Types of bolster cooling – Insert cooling, Deep chamber design, Bubbler cooling, Baffle cooling, spiral cooling –cooling circuits – Principle of heat pipe, heat rod, capillary tube and its applications – Cooling for sprue bush – cooling nipples – Calculation of cooling efficiency, cooling time. Mould heating methods, Mould temperature controller.

UNIT-V

Parting line/Parting surface: Flat parting surface – Non flat parting surface – stepped parting surface, irregular parting surface, angled surface, local stepped and profile

surface, complex edge forms –Mould Venting.Mould ancillary parts. Push back pin, Sprue Puller pin , life of mould, mould maintenance. Mould Assembling Procedure, Mould Designer's Check ListMould Maintenance,Mould Assembling Procedure

Course outcomes:

Upon completion of this course, the students will be able to :-

- Describe concepts of Engineering design.
- Interpret the basic mould drawing.
- Describe construction of different type of moulds.
- Prepare drawing with the layout of mould components
- Inspect mould parts against relevant drawing.
- Create report for mould and mould part production.
- Perform repair of mould

Text Books

1. Product design with plastics -By Dym
2. Plastics product design – By Beck
3. Plastics Product Design Engineering Hand Book - By Dubois, H
4. Injection Mould Design for Thermoplastic - By Pye, R.G.W
5. Injection Mould & Molding - By Dym

Reference Books

1. Plastic Design & Processing - By Sharma, S.C
2. Plastics Moulds& Dies - By Sors, & Others
3. Injection Mould Design Fundamentals (Vol. I& II) - By Glanvill&Dento
4. Polymer product design materials and processing-By David H Morton Jons John wellis
5. Plastics Product Design & Process Engineering - By Belofsky, Harold
6. Plastics product design part A & B -By Millar ,Edward
7. Plastics part design for injection moulding- By Malloy , Robert,A
8. Injection Moulds – 130 Proven Design - By Gastrow, H

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology
Semester: III
Branch: Plastics Engineering
Code: **B095314(095)**
Subject: Strength of Materials
Credit : 03
ESE Duration: 03 Hours
Maximum Marks: 100
Minimum Marks: 35

Course Objectives

This course aims at giving an insight to students about the behavior of material under external forces.
This course aims at teaching the students the concept of stress, strain elasticity etc as applied to various structural members under loading are included.

UNIT- I

Stresses & Strain, Hooke's law, Elastic limit, Yield stress, Ultimate stress, Working stress, Factor of safety, Poisson's ratio, Shear stress and strain, Modulus of rigidity, Bulk modulus, Relationship between elastic constants, Thermal stresses.

UNIT-II

Principal planes and Principal Stresses (two-dimensional)- Mohr's circle of stress. Mechanical properties of metals, Testing of materials, Classification and importance of mechanical tests, Destructive test, Nondestructive test.

UNIT- III

Loads, support, Types of beam, shear force and bending moment, calculation of shear force and bending moment atany section, shear force diagram, bending moment diagram, Relation between load, shear force and bending moment, inclined loading, simply supported beam with couples. Bending and shearing stresses in a beam, positionof simple neutral axis, Theory of simple bending, Design criteria and section modulus, Practical application ofbending equation.

UNIT-IV

Bolted joint, Welded joint, types of riveted connections, Failure of riveted joints, types of welds, strength of welds,Fillet welding of unsymmetrical section.

UNIT-V

Stresses and Strains in thin cylindrical and spherical shells subjected to internal

pressure, Design of thin cylindricalshell, Stresses in walls of thick cylinders under internal pressure (excluding compound cylinders). Lame's equations.

Course outcomes:

After completing this course the students should be able to solve

1. Cases of axially loaded members for stresses
2. Beams under bending for stresses
3. Know the basic of mechanical design of process vessels
4. Solve transversely loaded beams for internal shear forces, bending moments and deflection.
5. Understand the importance and application of material testing.

Text Books:

1. Ramamrutham S., Strength of Materials, DhanpatRaiPublication, 15th Edition.
2. Singh Sadhu , Strength of Materials , Khanna Publishers , 5th Edition

Reference Books:

1. Rajput R.K., Strength of Materials, S.Chand, 1st Edition.
2. Popov P.E. ,Engineering Mechanics of Solids, Prentice Hall of India ,Eastern Economy,Edition

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology
Semester: III
Branch: Plastics Engineering
Code: **B095315(095)**
Subject: Thermodynamics of Plastics Engineering
Credit : 02
ESE Duration: 03 Hours
Maximum Marks: 100
Minimum Marks: 35

Course Objectives

To impart knowledge on the concepts and application of thermodynamics to Polymer engineering systems and processes.

UNIT-I

Introduction: Laws of thermodynamics; closed system and open system; concept of entropy, enthalpy, and free energy; PVT behavior of fluids; Gibb's phase rule; Heat engines.

UNIT-II

Thermodynamic Properties of Fluids: Virial and cubic equations of state, theorem of corresponding states, generalized correlations for gases and liquids; Property relations for homogeneous phases; Concept of residual properties; Property relations for two-phase systems; Thermodynamic diagrams.

UNIT-III

Phase Equilibrium: Nature of equilibrium, the phase rule, Duhem's theorem, qualitative behavior of vapour liquid equilibria (VLE), VLE by modified Raoult's law and from K-value correlations.

UNIT-IV

Solution Thermodynamics: Chemical potential and phase equilibria, ideal-gas mixtures, partial properties, fugacity coefficients; Ideal solution, excess properties, activity

coefficients; Models for excess Gibbs energy; Property changes in mixing, heat effects; VLE for miscible, partially miscible and immiscible systems.

UNIT-V

Chemical-Reaction Equilibrium: Application of equilibrium criteria to chemical reactions, the standard Gibbs-energy change and the equilibrium constant, evaluation of equilibrium constants; Equilibrium conversions for single reactions.

Course outcomes:

Upon completion of this course, the students will be able to

1. Apply the laws of thermodynamics to solve problems
2. Determine the various thermodynamic properties of the fluids.
3. Explain the thermodynamics of solution
4. Explain the phase equilibrium
5. Know the equilibrium criteria in chemical reactions

Text Books:

1. Kyle B.G., "Chemical and Process Thermodynamics", 3rd Ed., Prentice 2008, Hall of India.
2. Borgnakke, C. and Sonntag, R.E., " Fundamentals of Thermodynamics," Wiley India
3. Nag, P.K., "Engineering Thermodynamics", Tata-McGraw Hill

Reference:

1. Sandler S.I., "Chemical, Biochemical, and Engineering Thermodynamics", 4th Ed., John Wiley. 2008
2. Smith J. M., Van Ness H. C. and Abbott M. M., "Introduction to Chemical Engineering Thermodynamics", 6th Ed., Tata McGraw Hill.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology | **Semester**: III

Branch: Plastics Engineering | **Code:B095321(095)**

Subject: Polymer Chemistry Lab | **Credit : 01**

Maximum Marks: 40 | **Minimum Marks**: 20

Identification of polymers by simple methods like density, melting point, burning characteristics, solubility and confirmatory test by chemical analysis.

A. Plastics

1. Polyethylene
2. Polypropylene
3. Polystyrene
4. Polyvinyl Chloride
5. Polyamide
6. Polyethyleneterephthalate
7. Polybutyleneterephthalate
8. Polycarbonate
9. Polyacetal
10. Polyphenyleneoxide
11. Polyphenylenesulphide
12. PhenolFormaldehyde
13. Ureaformaldehyde
14. Melamineformaldehyde.

B. Identification Of Rubbers By Simple Methods

1. Natural Rubber (NR)
2. PolybutyleneRubber (BR)
3. StyreneButadieneRubber (SBR)
4. IsopreneRubber (IR)
5. Isobutienelsoprene Rubber (IIR)
6. ChloropreneRubber (CR)
7. Acrylonitrile–ButadieneRubber (NBR)
8. SiliconeRubber

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

1. Bunsen Burner 15Nos
2. Glassware's 15Nos

3. Electronic Balance 1No
4. Thermostatic Water bath 2Nos
5. Melting Point Apparatus 1No
6. Retort Stand and
7. Polymer Samples

Text Books:

1. V. R. Gowariker, "Polymer Science" – New Age International (P) Ltd, Publishers

Reference:

1. Identification Of Plastics And Rubbers By Simple Methods,CIPET, Publications 2002.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology
Semester: III
Branch: Plastics Engineering
Code: **B095322(095)**
Subject: CAD / CAM Lab
Credit : 01
Maximum Marks: 40
Minimum Marks: 20

1. Sketcher: Line, Arc, Circle Ellipse, Spline,
2. Solid modeling **:**Extrude, Revolve, Sweep etc and Variational sweep, Loft ,etc
3. Surface modeling**:** Extrude, Sweep, Trim ..etc and Mesh of curves, Free form etc 4-Feature manipulation**:** Copy, Edit, Pattern, Suppress, History operations etc.
4. Assembly: Constraints, Exploded Views, Interference check
5. Drafting**:** Layouts, Standard & Sectional Views, Detailing & Plotting. 7-Import & Export in various extrusion file.
6. CAM Turning : Facing, Turning, Grooving, Parting etc.
7. CAM Milling : 2D operation, Pocket, Drilling, Taping etc.
8. CAM Surface Milling : 3D operation, Simulation & generation of N.C. code etc .

Reference:

1. Computer Integrated Manufacturing Systems Yoram Koren (McGraw Hill, 1983)

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: Bachelor of Technology
Semester: III
Branch: Plastics Engineering
Code: **B095323(095)**
Subject: Strength of Materials Lab
Credit : 01
Maximum Marks: 40
Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To study the Universal Testing Machine.
2. To perform the tensile Test of Mild Steel on U.T.M.and Draw Stress- Strain Curve.
3. To determine strength of wood on U.T.M. (i) Along the Grain (ii) Across the Grain.
4. To determine shear strength of Mild Steel on U.T.M.
5. To observe Flexural Behavior of Timber specimen and to determine it'sstrength under transverse loading on U.T.M.
6. To study the Impact Testing Machine and test specimen of Izod and Charpytests.
7. To determine Izod and Charpy Value of the given mild steel specimen.
8. To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material.
9. To study the Spring Testing Machine.
10. To determine modulus of rigidity for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring testing machine.
11. To study the Torsion Testing Machine
12. To determine ultimate shear stress and modulus of rigidity under Torsion.
13. To study the Cupping Test Machine and to determine Erichsen value of Mild Steel Sheet.
14. To study the Rockwell Harness Testing Machine and to determine the Rockwell Hardness of the given material.
15. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
16. To study the Vickers Hardness Machine and to conduct a test on the machine.

Equipment/Machines/Instruments/Tools/Software Required:

UTM Izode and charpy apparatus Fatigue Testing Machine Impact Testing Machine Torsion Testing Machine Spring Testing Machine,Rockwell Hardness, Testing Machine Cupping Testing Machine, Brinell Testing Machine Vickers Hardness.

Recommended Books:

1. Ramamrutham S., Strength of Materials, DhanpatRaiPublictaion, 15th Edition
2. Rajput R.K., Strength of Materials, S.Chand, 1st Edition.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology
Semester: III
Branch: Plastics Engineering
Code: B095324 (095)
Subject: Software Lab (Programming in C++)
Credit: 1
Maximum Marks: 40
Minimum Marks: 20

Introduction to the Object Oriented Programming, Basic concepts of OOP, Benefits of OOP, and Overview of C++: History of C++, Data Types: Built in data types, User defined data types, Derived data types. Constants and Variable: symbolic constants, Dynamic initialization of variable. Operators in C++. Control structures: if else, nested if else, for, while, do while, break, continue, switch, goto statement.

At least ten experiments are to be performed by each student

1. Write a C++ program to perform arithmetic operations.
2. Write a C++ program to check Whether a Number is Prime or Not.
3. Write a C++ program to check factorial of given number.
4. Write a C++ program to swap two numbers.
5. Write a C++ program to find largest of three numbers.
6. Write a C++ program to find even and odd number.
7. Write a C++ program to check palindrome number.
8. Write a C++ program to print Fibonacci series.
9. Program for rate of first order chemical reaction. Using C++.
10. Program for rate of second order chemical reaction. Using C++.
11. Program for calculation of Prandtl Number (Pr.).Using C++.
12. Program for calculation of Reynolds Number (Re.). Using C++.
13. Program for Dittus –Boelter equation. Using C++.
14. Program for calculation of Nusselt Number (Nu.). Using C++.
15. Program for calculation of entropy. Using C++.

Reference Books:

1. Programming with C++ : D. Ravi Chandran
2. OOP's with C++ : E Balaguruswamy