Syllabus of
UNDERGRADUATE DEGREE COURSE

Plastic Technology

Rajasthan Technical University, Kota
Effective from session: 2021-22
### 3PT2-01: ADVANCED ENGINEERING MATHEMATICS-I

**Credit:** 4  
**Max. Marks:** 100 (IA:30, ETE:70)  
**3L+1T+0P**  
**End Term Exam:** 3 Hours

<table>
<thead>
<tr>
<th>SN</th>
<th>Contents</th>
<th>Hours</th>
</tr>
</thead>
</table>
| 1  | Numerical Methods – 1:  
| 2  | Numerical Methods – 2:  
| 3  | Laplace Transform:  
Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method. | 10 |
| 4  | Fourier Transform:  
Fourier complex sine and cosine transform, properties and formulae, inverse Fourier transforms, convolution theorem, application of Fourier transform to partial ordinary differential equation (one dimensional heat and wave equations only) | 7 |
| 5  | Z-Transform:  
Definition properties and formulae, convolution theorem, inverse Z-transform, application of Z-transform to difference equation. | 5 |
|    | **Total** | 40 |

**Text Books:**

**Reference Books:**
RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
2nd Year – III to IV Semester: B.Tech.: Plastic Technology

3PT1-02/3PT1-03: TECHNICAL COMMUNICATION

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:30, ETE:70)
End Term Exam: 3 Hours

<table>
<thead>
<tr>
<th>SN</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction: Objective, scope and outcome of the course.</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td><strong>Introduction to Technical Communication</strong> - Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td><strong>Comprehension of Technical Materials/Texts and Information Design &amp; development</strong> - Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td><strong>Technical Writing, Grammar and Editing</strong> - Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td><strong>Advanced Technical Writing</strong> - Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.</td>
<td>8</td>
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<td></td>
<td><strong>Total</strong></td>
<td>26</td>
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</tbody>
</table>

Text Books:

Reference Books:
### 3PT1-02/3PT1-03: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

**Credit:** 2  
**Max. Marks:** 100 (IA:30, ETE:70)  
**End Term Exam:** 3 Hours

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<tr>
<th>SN</th>
<th>Introduction: Objective, scope and outcome of the course.</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td><strong>Basic economic concepts</strong>- Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td><strong>Demand and Supply analysis</strong>- Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td><strong>Production and Cost analysis</strong>- Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.</td>
<td>5</td>
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<tr>
<td>5</td>
<td><strong>Market structure and pricing theory</strong>- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td><strong>Financial statement analysis</strong>- Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.</td>
<td>8</td>
</tr>
</tbody>
</table>

**TOTAL: 26**

**Text Books:**

**Reference Books:**
3PT3-04: MATERIALS ENGINEERING

Credit: 2  Max. Marks: 100 (IA:30, ETE:70)
2L+0T+0P  End Term Exam: 3 Hours

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<tbody>
<tr>
<td>1</td>
<td><strong>Introduction:</strong> Objective, scope and outcome of the course.</td>
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<tr>
<td>2</td>
<td><strong>Introduction to materials:</strong> Atomic structure, bonding aggregates of atom. <strong>Crystals Structure:</strong> crystal structure, periodicity in crystal, types of structures: SC, BCC, FCC and HCP Crystals system, crystal lattice, unit cell, crystal direction, crystal planes, Miller indices, inter planar spacing.</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td><strong>Classification of materials:</strong> Metals, ceramics and polymers- Selection of materials and processes in engineering design, environmental impact of materials, microstructure-property relations, crystalline structure, deformation imperfections, Alloys types and phases, equilibrium diagram, critical points, Iron carbon equilibrium diagram.</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td><strong>Heat treatment:</strong> Heat treatment processes and constituents T-T diagram. Introduction to heat treatment furnaces. Effect of alloying element on the properties of carbon steels, SAE/AISI and other classifications, general properties, compositions and uses of structural, corrosion resisting and heat resisting steels.</td>
<td>5</td>
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<tr>
<td>5</td>
<td><strong>Alloys</strong> Composition and uses of alloys of aluminum, copper, nickel and bearing materials, corrosion and its prevention. Cutting tools and the materials, spring alloy, electric, magnetic and non-magnetic alloys.</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td><strong>Characterization of Materials:</strong> Introduction to the mechanical behavior of the materials such as tension, compression, fracture, fatigue and creep. Principle, Construction and Procedure for characterization of material using Scanning Electron Microscopy (SEM), Atomic force microscopy (AFM), XRD Analysis.</td>
<td>5</td>
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<td><strong>Total</strong></td>
<td>26</td>
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**Text Books:**

Reference Books:

3PT4-05 : FUNDAMENTALS OF POLYMER SCIENCE

Credit: 3  
Max. Marks: 100 (IA:30, ETE:70)  
3L+0T+0P  
End Term Exam: 3 Hours

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<td><strong>Introduction:</strong> Objective, scope and outcome of the course.</td>
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<tr>
<td>2</td>
<td><strong>Basic concepts of polymer:</strong> Basic concepts of macromolecules – Monomers - Functionality - Classification and nomenclature of polymers - Types of polymers. History of polymer science, Classification of Polymers, Functionality and structure of polymers, addition polymers, condensation polymers, copolymers, Physical properties and characterization of polymers, effect of structure on properties of polymers, Inorganic polymers.</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td><strong>Polymer Molecular weight:</strong> Molecular weight- Molecular weight averages - Molecular weight distribution - Unidispersity, polydispersity, Degree of polymerization. Size of polymer molecules. Molecular weight determination - Basic concepts of end group analysis, colligative properties, osmametry, light scattering, and gel permeation chromatography - Viscosity of polymers solutions.</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td><strong>Transitions and orders in polymers:</strong> Glass transition temperature ( T_g ), Melting and other Transitions, significance and factors influencing the ( T_g ). Effect of Plasticizers on ( T_g ), Glass transition of copolymers. Morphology and order of Polymers, Crystallinity in polymers, Degree of crystallinity and Polymer crystallization. Effect of crystallinity on properties of Polymers.</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td><strong>Reaction of polymers:</strong> Chemical reactions of polymers – Addition and substitution reactions - Hydrolysis – Acidolysis – Aminolysis — cross linking reactions. Polymer degradation – Mechanical degradation – Oxidative degradation – Hydrolytic degradation – Photo degradation.</td>
<td>8</td>
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<td></td>
<td><strong>Total</strong></td>
<td>36</td>
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</tbody>
</table>

**Text Books:**

**Reference Books:**
## 3PT4-06: SYNTHESIS & POLYMREIZTION ENGINEERING

**Credit:** 3  
**Max. Marks:** 100 (IA:30, ETE:120)  
**End Term Exam:** 3 Hours

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<tr>
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</thead>
<tbody>
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<td>1</td>
<td><strong>Introduction:</strong> Objective, scope and outcome of the course.</td>
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</tr>
<tr>
<td>2</td>
<td><strong>Polymerization:</strong> Industrial methods of polymerization such as bulk, solution, suspension, emulsion. Layout and arrangement of polymer plant. Types of polymer production processes and reactors. Safety and plant automation.</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td><strong>Stereo-chemistry:</strong> Concept of stereo-chemistry of polymers, stereo-specific polymerization. Catalyst – their utility in polymer manufacture, Zeigler Natta, Metalloocene and other catalyst systems.</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td><strong>Copolymerization:</strong> Mechanism and Kinetics of free radical - Ionic copolymerization - Determination of Monomer reactivity ratios. Polymerization techniques - Bulk polymerization - Solution polymerization - Suspension polymerization - Emulsion polymerization - Interfacial condensation.</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td><strong>Thermoplastic Manufacturing process:</strong> Manufacturing processes of basic raw materials and intermediates of synthetic polymers. Production technology, properties and application of important plastics such as polyethylene, polypropylene, polystyrene and polyvinyl chloride. Brief introduction of copolymers based on the common monomers such as ethylene, vinyl chloride, styrene, acrylates and methacrylates etc</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td><strong>Thermoset Manufacturing process:</strong> Manufacturing details, properties and applications of various thermosetting resins such as phenol formaldehyde, urea-formaldehyde and melamine-formaldehyde and preparation of molding powders.</td>
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<td>36</td>
</tr>
</tbody>
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### Text Books:

### Reference Books:
## 3PT4-07: PLASTICS MATERIALS-I

**Credit:** 3  
**Max. Marks:** 100 (IA:30, ETE:70)  
**3L+0T+0P**

**End Term Exam:** 3 Hours

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<td>1</td>
<td><strong>Introduction:</strong> Objective, scope and outcome of the course.</td>
<td>1</td>
</tr>
</tbody>
</table>
| 2  | **Introduction to Polymeric Materials:**  
Thermoplastics, Thermosets, commodity, Engineering & High-performance plastics. Classification of polymeric materials based on applications.  
Structure of Plastics: Molecules – Crystallinity – Effect of Crystallinity on properties – cross linked plastics – Linear, Branched and cross linked structures in polymers. | 6 |
| 3  | **Commodity Thermoplastics-I**  
Preparation - properties - and applications of Polyolefine-Polyethylene-LDPE -LLDPE- HDPE, HMWHDPE- UHMWHDPE - Crosslinked polyethylene- Chlorinated polyethylene –Polypropylene – Homo & Co polymer | 9 |
| 4  | **Commodity Thermoplastics-II**  
Preparation - properties - and applications of Vinyl plastics - Polyvinyl chloride, C-PVC, Polyvinyl Acetate, Polyvinylidene chloride, Polyvinyl alcohol, Polystyrene | 8 |
| 5  | **General Purpose Thermosets**  
Preparation - properties - and applications of: Phenol formaldehyde (PF), Amino plastics: Urea formaldehyde (UF) - Melamine formaldehyde (MF), Unsaturated polyesters, Alkyd resins. | 6 |
| 6  | **Engineering and Speciality Thermosets**  
Preparation - properties - and applications of: Epoxy Resins, Polyurethanes (PU) Silicone polymers | 6 |
|    | **Total** | **36** |

**Text Books:**

**Reference Books:**
### 3PT4-: IDENTIFICATION OF POLYMERS LAB

**Credit:** 2  
**Max. Marks:** 100 (IA:60, ETE:40)

<table>
<thead>
<tr>
<th>List of Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identification of unknown polymer using heating, burning, solubility</td>
</tr>
<tr>
<td>2. Confirmatory chemical tests for Identification of unknown polymer</td>
</tr>
<tr>
<td>3. Identification of polymers using FTIR</td>
</tr>
<tr>
<td>4. Quantitative estimation of the basic raw materials and auxiliaries used in polymer such as plasticizers, fillers</td>
</tr>
<tr>
<td>5. Determination of purity of solvents, monomers and other auxiliaries.</td>
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<tr>
<td>6. Determination of physical properties-melting point.</td>
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<tr>
<td>7. Determination of physical properties-refractive index</td>
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<tr>
<td>8. Determination of physical properties-specific gravity of polymer materials.</td>
</tr>
<tr>
<td>10. Determination of intrinsic viscosity (I.V) of raw materials and its significance</td>
</tr>
</tbody>
</table>
RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
2nd Year – III to IV Semester: B.Tech.: Plastic Technology

3PT4-: SYNTHESIS & POLYMERIZATION ENGINEERING LAB

Credit: 2
0L+0T+4P

List of Experiment

1. Synthesis of polymers by Bulk polymerization techniques
2. Synthesis of polymers by solution polymerization techniques
3. Synthesis of polymers by suspension polymerization techniques
4. Synthesis of polymers by emulsion polymerization techniques
5. Preparation of phenol formaldehyde resin
6. Preparation of urea formaldehyde resin
7. Preparation of unsaturated polyester resin
8. Determination of acid value in unsaturated polyester resin
9. Synthesis of copolymers based on any common monomers like styrene, acrylates, maleic anhydride, acrylic acid and methacrylic acid
10. Depolymerization of waste thermoplastics such as polystyrene or polymethyl methacrylate.
Objectives: At the end of the semester, the students should have clearly understood and implemented the following:

1. Stating a database design & application problem.
2. Preparing ER diagram
3. Finding the data fields to be used in the database.
4. Selecting fields for keys.
5. Normalizing the database including analysis of functional dependencies.
6. Installing and configuring the database server and the front end tools.
7. Designing database and writing applications for manipulation of data for a standalone and shared database including concepts like concurrency control, transaction roll back, logging, report generation etc.
8. Get acquainted with SQL.

In order to achieve the above objectives, it is expected that each student will choose one problem. The implementation shall begin with the statement of the objectives to be achieved, preparing ER diagram, designing of database, normalization and finally manipulation of the database including generation of reports, views etc. The problem may first be implemented for a standalone system to be used by a single user. All the above steps may then be followed for development of a database application to be used by multiple users in a client-server environment with access control. The application shall NOT use web techniques. One exercise may be assigned on creation of table, manipulation of data and report generation using SQL.

Suggested Tools:
For standalone environment, Visual FoxPro or any similar database having both the database and manipulation language may be used.
For multi-user application, MYSql is suggested. However, any other database may also be used. For front end, VB.Net, Java, VB Script or any other convenient but currently used by industry may be chosen. Indicative List of exercises:

1. Student information system for your college.
2. Student grievance registration and redressal system.
3. A video library management system for a shop.
4. Inventory management system for a hardware/sanitary item shop.
5. Inventory management system for your college.
6. Guarantee management system for the equipments in your college.
3PT7: INDUSTRIAL TRAINING

Credit: 1.0
Max. Marks: 50

Students have to undergo mandatory 15 days In-house/Industry training after II semester. Training examination will be held in III semester.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PT8--:</td>
<td>SOCIAL OUTREACH, DISCIPLINE &amp; EXTRA CURRICULAR</td>
<td>0.5</td>
<td>25</td>
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<tr>
<td></td>
<td>ACTIVITIES (SODECA)</td>
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</tbody>
</table>
**4PT2-01: DATA ANALYTICS**

**Credit:** 2  
**Max. Marks:** 100 (IA:30, ETE:70)  
**End Term Exam:** 3 Hours

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<td>1</td>
<td>Introduction: Objective, scope and outcome of the course.</td>
<td>1</td>
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<tr>
<td>2</td>
<td><strong>Introduction to Multivariate Statistics</strong>-Degree of Relationship among Variables-Review of Univariate and Bivariate Statistics-Screening Data Prior to Analysis-Missing Data, Outliers, Normality, Linearity, and Homoscedasticity.</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td><strong>Multiple Regression</strong>- Linear and Nonlinear techniques- Backward Forward-Stepwise- Hierarchical regression-Testing interactions (2way interaction) - Analysis of Variance and Covariance (ANOVA &amp; ANCOVA) - Multivariate Analysis of Variance and Covariance (MANOVA &amp; MANCOVA).</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td><strong>Logistic regression:</strong> Regression with binary dependent variable - Simple Discriminant Analysis- Multiple Discriminant analysis Assessing classification accuracy- Conjoint analysis (Full profile method).</td>
<td>5</td>
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<tr>
<td>5</td>
<td><strong>Principal Component Analysis</strong> -Factor Analysis- Orthogonal and Oblique Rotation-Factor Score Estimation-Multidimensional Scaling- Perceptual Map-Cluster Analysis (Hierarchical Vs Nonhierarchical Clustering).</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td><strong>Latent Variable Models</strong> an Introduction to Factor, Path, and Structural Equation Analysis- Time series data analysis (ARIMA model) – Decision tree analysis (CHAID, CART) - Introduction to Big Data Management.</td>
<td>5</td>
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</table>

**TOTAL** 26

**Text Books:**

**Reference Books:**
## Text Books:

## Reference Books:
# TECHNICAL COMMUNICATION

**Credit:** 2  
**Max. Marks:** 100 (IA:30, ETE:70)  
**End Term Exam:** 3 Hours

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<td><strong>Introduction to Technical Communication</strong>- Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.</td>
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<td>3</td>
<td><strong>Comprehension of Technical Materials/Texts and Information Design &amp; development</strong>- Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td><strong>Technical Writing, Grammar and Editing</strong>- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.</td>
<td>7</td>
</tr>
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<td>5</td>
<td><strong>Advanced Technical Writing</strong>- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.</td>
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**Text Books:**

**Reference Books:**
# 4PT3-04: PRINCIPLES OF CHEMICAL ENGINEERING

**Credit:** 3  
**3L+0T+0P**  
**Max. Marks:** 100 (IA:30, ETE:70)  
**End Term Exam:** 3 Hours

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<tr>
<td>1</td>
<td><strong>Introduction:</strong> Objective, scope and outcome of the course.</td>
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</table>
| 2  | **Fundamentals of Chemical Engineering and Fluid Flow:**  
   Introduction, units, concept of atomic weight, equivalent weight and moles,  
   composition of solids, liquids and solution, gas constant, ideal gas law.  
   Fluid flow: Newtonian and Non-Newtonian fluid - Bernoulli’s theorem-Hagen Poisuelle  
   equation, measurement of fluid flow- orifice meter, venturi meter and pitot tube. | 8     |
| 3  | **Mechanical Operations:** Properties of solids - Sieve analysis; Laws of crushing,  
   Crushers and grinders. Principle of separation and selection and details of equipment  
   for screening, sedimentation, cyclones and hydro cyclones. (Basic principles and  
   equipment description only. Mathematical consideration not required) | 9     |
| 4  | **Mass Transfer:** Principles of diffusion, theory of diffusion, Two film theory and  
   mass transfer coefficients Humidification - operation, humidity chart, equipment’s -  
   cooling towers and spray chambers Drying - Principles and definitions. Rate of batch  
   drying- Equipment for drying (Basic principles and equipment description only.  
   Mathematical consideration not required) | 9     |
| 5  | **Unit Operations:** Distillation - flash distillation, and binary distillation. Industrial  
   equipment for distillation, types of heat exchangers, shell & tube heat exchangers.  
   Evaporators and types of evaporators.                                                      | 9     |

**Total**  
36

**Text Books:**  

**Reference Books:**  
# 4PT4-05: FLUID MECHANICS

**Credit:** 3  
**Max. Marks:** 100 (IA:30, ETE:70)  
**3L+0T+0P**  
**End Term Exam:** 3 Hours

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<td>1</td>
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</tbody>
</table>
| 2  | **Fluid Properties:**  
Classification: Ideal fluid, Newtonian and Non-Newtonian fluids; Newton’s law of viscosity. Pascal’s and Hydrostatic law, manometers. Types of manometer. | 5     |
| 3  | **Fluid dynamics:**  
One dimensional equation of motion; Bernoulli’s equation; application; application of Bernoulli’s equation. Friction losses in pipe flow, valves and fittings, k-values, sudden expansion and contraction, pipe flow problems Nozzle. Introduction to laminar & turbulent flow. Velocity Distribution for turbulent flow, concept of Reynolds number & friction factor. | 8     |
| 4  | **Fluid Statics & Kinetics:**  
Fluid pressure and its measurement. Continuity equation; types of flow. Darcy – Weisbach’s equation. Head loss in pipes. Pipes in series/Parallel. Classification, basic construction and application of different types of pumps. | 8     |
| 5  | **Pumps:**  
Centrifugal pump, Principles and application in Bernoulli’s theorem Types of Pump: Axial pumps, Gear pump, Plunger Pumps Vane pump, Reciprocation pump and Screw pump. Characteristic Curves of Pumps. Valves, types of valves | 8     |
| 6  | **Flow Metering:**  
Metering of fluids; orifice meter, Venturimeter, Pitot tube, Rotameter, Notches, Gas flow meters, coefficient of discharge. | 6     |

| Total | 36 |

**Text Books:**

**Reference Books:**
## Syllabus

**RAJASTHAN TECHNICAL UNIVERSITY, KOTA**

**Syllabus**

2nd Year – III to IV Semester: B.Tech.: Plastic Technology

**4PT4-06: HEAT TRANSFER**

**Credit:** 4  
**4L+0T+0P**  
**Max. Marks:** 100 (IA:30, ETE:70)  
**End Term Exam:** 3 Hours

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<td>1</td>
</tr>
<tr>
<td>2</td>
<td><strong>Conduction:</strong> Heat transfer modes, laws; General heat equation; Steady state problems in plane and composite systems; Thermal resistance; Insulation and critical radius; unsteady state heat conduction; Extended surfaces as Fins.</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td><strong>Convection:</strong> Principle Heat balance Equation in laminar flow; Natural convection heat transfer from plate and cylinder. Principles, Dimensional analysis of Heat Transfer by Forced. Principles, Dimensional analysis of Heat Transfer by Natural, Laminar and Turbulent Boundary layers; Laminar and turbulent flow heat transfer in a circular pipe. Dimensional groups in Heat Transfer</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td><strong>Condensation and Boiling:</strong> Types of condensation: Drop and Film condensation, Condensation on a vertical plate, vertical tube and horizontal tubes. Effect of superheated vapor and non-condensable gases. Types of boiling: Pool and forced boiling; boiling curves; Simplified relations for boiling heat transfer with water; Critical Flux.</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td><strong>Radiation:</strong> Basic concepts; Emission characteristics and laws of black body radiation; Radiation incident on a surface; Solid angle and radiation intensity. Heat exchange by radiation between two black surface elements; Heat exchange by radiation between two finite black surfaces; shape factor; Radiation shields.</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td><strong>Heat Exchangers</strong> Classification of heat exchangers; Overall heat transfer coefficient, fouling factor calculations; Analysis of Heat Exchangers: Logarithmic Mean temperature difference, Effectiveness – NTU Method.</td>
<td>7</td>
</tr>
</tbody>
</table>

Total: 40

**Text Books:**


**Reference Books:**

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus
2nd Year – III to IV Semester: B.Tech.: Plastic Technology
4PT4-07: PLASTICS MATERIALS-II

Credit: 3
3L+0T+0P

Max. Marks: 100 (IA: 30, ETE:70)
End Term Exam: 3 Hours

<table>
<thead>
<tr>
<th>SN</th>
<th>Contents</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Introduction:</strong> Objective, scope and outcome of the course.</td>
<td>1</td>
</tr>
</tbody>
</table>
| 2 | **Engineering Plastics – I**
Preparation - properties - and applications: Styrene copolymers–High Impact Polystyrene (HIPS), Acrylonitrile Butadiene Styrene (ABS), Styrene acrylonitrile (SAN), Acrylic plastics-Poly(methyl methacrylate), Polyacrylonitrile , Ethylene Vinyl Alcohol (EVA). | 6 |
| 3 | **Engineering Plastics – II**
Preparation- properties - and applications: Polyamides-Nylons 6, (6,6), (6,10), 11, 12, Polyesters–Polyethylene terephthalate, polybutylene terephthalate, Polycarbonate, Polylactals. | 8 |
| 4 | **Specialty and High Performance Plastics**
Preparation-properties-and applications: Aromatic ether-Poly(phenylene oxide) (PPO), Aromatic thioether-Poly(thioether sulphide) (PPS), Polysulfone, Aromatic polyamides. Preparation-properties-and applications: Polyimides (PI) Polyimideimide (PAI), Polyimidazoles, Fluropolymers–Polyvinyl fluoride (PVF), Polyvinylidene fluoride (PVDF), Polytetrafluoroethylene (PTFE), Polychlorotrifluoroethylene (PCTFE). | 9 |
| 5 | **Thermoplastic Elastomers:**
Basic structure, Manufacture, Morphology, Commercial grades and Applications–Thermoplastic styrene block copolymers, Polyester thermoplastic elastomers, polyamide thermoplastic elastomer, Polyurethane thermoplastic elastomers. | 6 |
| 6 | **Water Soluble Polymers and Bio Degradable Polymers:**

| | Total | 36 |

**Text Books:**
Reference Books:
Syllabus of 2nd Year B. Tech. (PT) for students admitted in Session 2021-22 onwards.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
2nd Year – III to IV Semester: B.Tech.: Plastic Technology

4PT4-: CHEMICAL ENGINEERING LAB

Credit: 1.5
Max. Marks: 100 (IA:60, ETE:40)

List of Experiment

1. To find the Pressure drop in packed bed
2. To study the concept of Fluidization by using fluidized bed
3. To find the Thermal conductivity of solids.
4. To find overall heat transfer coefficient of the Heat exchanger
5. To find the Stefan-Boltzman constant
6. To find the new surface area created by Jaw crusher
7. To find the critical speed of Ball Mill
8. To find the Screening efficiency.
9. To separate the component by Simple distillation
10. To separate the component by using steam distillation
11. To find the Particle size and Surface area of filler particles.

Office of Dean Academic Affairs
Rajasthan Technical University, Kota
4PT4-: FLUID MECHANICS LAB

Credit: 1.5
0L+0T+3P

Max. Marks: 100 (IA: 60, ETE:40)

<table>
<thead>
<tr>
<th>List of Experiment</th>
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</thead>
<tbody>
<tr>
<td>1. Reynolds experiment for Laminar, transitional and turbulent flow identification, through Reynolds apparatus.</td>
</tr>
<tr>
<td>2. Verification of Bernoulli’s Equation through Bernoulli’s Theorem Apparatus.</td>
</tr>
<tr>
<td>3. Determination of co efficient of Discharge for Orifice, Venturimeter through Venturimeter and orifice meter test rig.</td>
</tr>
<tr>
<td>4. Estimation of losses through pipe fitting, sudden enlargement and contraction frictional Pressure drop in Circular pipes.</td>
</tr>
<tr>
<td>5. Verification of Darcy’s Law through Darcy apparatus.</td>
</tr>
<tr>
<td>7. To Study pitot tube apparatus and cavitation apparatus in a pipe flow.</td>
</tr>
</tbody>
</table>
4PT4-: HEAT TRANSFER LAB

Credit: 1.5
0L+0T+3P

Max. Marks: 100 (IA: 60, ETE:40)

List of Experiment

1. To determine the thermal conductivity of Liquid.
2. To determine the equivalent thermal conductivity of composite wall.
3. To determine heat transfer coefficient in force convection and natural convection
4. Study of Unsteady state Heat Transfer Unit
5. To determine heat transfer coefficient with the help of Stefan Boltzmann Apparatus.
6. To calculate emissivity of the test plate by emissivity measurement apparatus.
7. To determine heat transfer coefficient in double pipe heat exchanger.
8. To study the heat transfer characteristics of a shell and tube heat exchanger.
9. To measure determine the heat transfer coefficient and heat transfer rate of film wise and drop wise condensation of pure water vapor.
10. To determine rate of evaporation through single effect evaporator.
### 4PT4-: PLASTICS MATERIAL TESTING LAB-I

**Credit:** 1.5  
**Max. Marks:** 100 (IA:60, ETE:40)  
**0L+0T+3P**

<table>
<thead>
<tr>
<th>List of Experiment</th>
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<tbody>
<tr>
<td>1. Determination of Ash Content in plastics materials.</td>
</tr>
<tr>
<td>2. Determination of Filler content in plastics materials.</td>
</tr>
<tr>
<td>3. Determination of Melt flow index of plastics materials.</td>
</tr>
<tr>
<td>7. Study of weathering properties of plastics materials.</td>
</tr>
<tr>
<td>9. Compounding or Blending using two roll mill</td>
</tr>
<tr>
<td>10. Specimen preparation using contour cutter.</td>
</tr>
<tr>
<td>11. Determination of Bulk density for powder materials.</td>
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</tbody>
</table>
### 4PT8--: SOCIAL OUTREACH, DISCIPLINE & EXTRA CURRICULAR ACTIVITIES (SODECA)

| Credit: 0.5 | Max. Marks: 25 |