

Syllabus of
UNDERGRADUATE DEGREE COURSE

Plastic Technology



Rajasthan Technical University, Kota
Effective from session: 2021-22



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

3PT2-01: ADVANCED ENGINEERING MATHEMATICS-I

Credit: 4
3L+1T+0P

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

SN	Contents	Hours
1	Numerical Methods – 1: Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	10
2	Numerical Methods – 2: Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	8
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:

1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt. Ltd, 2021.
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw-Hill, 2017.

Reference Books:

1. M. K. Jain, S.R.K. Iyengar and R.K. Jain, "Numerical Methods", New Age International Private Ltd, 2021.
2. S.S.Sastry, "Introductory Methods of Numerical analysis", Prentice Hall India Learning Private Ltd, 2012.
3. S.L. Ross, "Differential Equation", Wiley India Pvt. Ltd., 2016

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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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Technical Communication- 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.	4
3	Comprehension of Technical Materials/Texts and Information Design & development- 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.	5
4	Technical Writing, Grammar and Editing- 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.	8
5	Advanced Technical Writing- 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.	8
	Total	26

Text Books:

1. Gajendra Singh Chauhan, L. Thimmesha and Smita Kashiramka, “Technical communication”, Cengage learning India Private Ltd., 2019.

Reference Books:

1. Meenakshi Raman and Sangeeta Sharma, “Fundamental of Technical Communication”, Oxford University Press, 2014.
2. M. Ashraf Rizvi, “Effective Technical Communication”, McGraw Hill Education 2nd Ed., 2017.
3. Kavita Tyagi and Padma Misra, “Basic Technical communication”, Prentice Hall India Learning Pvt. Ltd., 2011.
4. Phillip A. laplante, “Technical writing: A practical guide for engineers and scientists”, CRC Press, 2011.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

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

Credit: 2
2L+0T+0P

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

SN		Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic economic concepts- 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.	4
3	Demand and Supply analysis- 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.	4
4	Production and Cost analysis- 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.	5
5	Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	Financial statement analysis- 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.	8
	TOTAL	26

Text Books:

1. Craig H. Petersen, W Cris Lewis and Sudhir K Jain, “Managerial Economics”, Pearson Education India, 2005.
2. D. N. Dwivedi, “Managerial Economics”, S.Chand (G/L) & Company ltd, 2010.
3. Asish K Bhattacharya, “Essentials of Financial Accounting”, PHI Learning, 2017.
4. Dr. V. K. Goyal and Ruchi Goyal, Financial Accounting for BBA”, Prentice hall India Learning Private Limited, 2012.

Reference Books:

1. Dr. S.N. Maheshwari & Sharda K Maheshwari, “Financial Accounting”, Vikas Publishing House, 2018.
2. Donald N. Stengel, “Managerial Economics”, Business Expert Press, 2011.

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Syllabus

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

3PT3-04: MATERIALS ENGINEERING

Credit: 2
2L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to materials: Atomic structure, bonding aggregates of atom. Crystals Structure: 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.	5
3	Classification of materials: 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.	5
4	Heat treatment: 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.	5
5	Alloys 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.	5
6	Characterization of Materials: 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.	5
Total		26

Text Books:

1. R. Balasubramaniam. "Callister's Materials Science and Engineering", Wiley India Pvt. Ltd., 2014.
2. M. Arumugham, "Material Science", Anuradha Agencies, 1st Ed., 1987.
3. G. E. Dieter, "Mechanical metallurgy", McGraw Hill, 2000.
4. J. C. Anderson, K. D. Leaver, R. D. Rawlings, J. M. Alexander, "Material Science", Springer US 4th Ed., 1990.
5. V. Raghavan, "Materials Science and Engineering: A First course", Prentice Hall India Learning Private Limited; 6th Ed., 2015.

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

Reference Books:

1. D. Askeland, “Materials Science and Engineering”, Brooks/Cole, 1st Ed, 2010.
2. W.F. Smith, Hashemi, J. & Prakash. R. “Materials Science and Engineering”, Tata Mcgraw Hill Education Pvt. Ltd., 2014.
3. Donald S. Clark and Wilbur R. Varney, “Physical metallurgy for engineers”, Van Nostrand Reinhold Company; 2nd Revised Ed., 1962.
4. M.A. Wahab, “Solid State Physics: Structure and Properties of Materials”, Narosa Publishing House, 2009.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

3PT4-05 : FUNDAMENTALS OF POLYMER SCIENCE

Credit: 3
3L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic concepts of polymer: 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.	8
3	Polymer Molecular weight: 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, osmometry, light scattering, and gel permeation chromatography - Viscosity of polymers solutions.	9
4	Transitions and orders in polymers: 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.	10
5	Reaction of polymers: Chemical reactions of polymers – Addition and substitution reactions - Hydrolysis – Acidolysis – Aminolysis — cross linking reactions. Polymer degradation – Mechanical degradation – Oxidative degradation – Hydrolytic degradation – Photo degradation.	8
Total		36

Text Books:

1. F.W. Billmeyer, "Textbook of Polymer Science", Wiley international publishers, 3rd Ed., 2008.
2. V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, "Polymer Science", New Age International (P) Ltd Publishers 2nd Ed., 2015.
3. George Odian, "Principles of polymerisation", Wiley international publishers 4th Ed., 2004.

Reference Books:

1. J.M.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. Joel R. Fried, "Polymer science & Technology", Pearson Prentice Hall, 3rd Ed., 2014.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

3PT4-06: SYNTHESIS & POLYMREIZTION ENGINEERING

Credit: 3
3L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Polymerization: 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.	6
3	Stereo-chemistry: Concept of stereo-chemistry of polymers, stereo-specific polymerization. Catalyst – their utility in polymer manufacture, Zeigler Natta, Metallocene and other catalyst systems.	7
4	Copolymerization: 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.	7
5	Thermoplastic Manufacturing process: 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	8
6	Thermoset Manufacturing process: Manufacturing details, properties and applications of various thermosetting resins such as phenol formaldehyde, urea-formaldehyde and melamine-formaldehyde and preparation of molding powders.	7
	Total	36

Text Books:

1. Gowriker, Viswanathan and Sreedhar, "Polymer Science", Wiley-Blackwell, 1987.
2. Christopher C. Ibeh, "Thermoplastic Materials: Properties, Manufacturing Methods, and Applications", Taylor and Francis Group, 2011.

Reference Books:

1. Mark & Overberger, "Encyclopedia of Polymer Science & Technology", Wiley, 1986.
2. George Odian, "Principles of Polymerization", Wiley-Interscience, 4th Ed., 2004.
3. Witold Kuran, "Principles of Cordination Polymerization", Wiley, 1st Ed., 2001.
4. Odian George, "Principles of Polymerization", McGraw-Hill Book Co., New York, 1970.
5. N. A. Dotson, R. Galvan, R. L. Laurence and M Tirrell, "Polymerization Process Modeling", VCH Publication, 1996.
6. S.K. Gupta and Anil Kumar, "Reaction Engineering of Step Growth Polymerization", Plenum Press, 1987.

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

3PT4-07: PLASTICS MATERIALS-I

Credit: 3
3L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
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:

1. J.A. Brydson, “Plastics Materials”, Butterworth- Heinemann - Oxford 7th Ed., 2001.
2. Feldman. D and Barbalata. A, “Synthetic Polymers”, Chapman Hall, 1996.

Reference Books:

1. V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, “Polymer Science”, New Age International (P) Ltd Publishers 2nd edition, 2015.
2. Olagoke Olabisi, “Hand Book of Thermoplastics”, Marcel Decker Inc., 1997.
3. K.J. Saunders, “Organic Polymer chemistry”, Chapman & Hall, 1988.
4. Irvin. I. Rubin, “Hand Book of Plastic Materials and Technology”, Wiley Interscience, 1990.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

3PT4-: IDENTIFICATION OF POLYMERS LAB

Credit: 2
0L+0T+4P

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

List of Experiment

1. Identification of unknown polymer using heating, burning, solubility
2. Confirmatory chemical tests for Identification of unknown polymer
3. Identification of polymers using FTIR
4. Quantitative estimation of the basic raw materials and auxiliaries used in polymer such as plasticizers, fillers
5. Determination of purity of solvents, monomers and other auxiliaries.
6. Determination of physical properties-melting point.
7. Determination of physical properties-refractive index
8. Determination of physical properties-specific gravity of polymer materials.
9. Determination of Moisture content in polymer raw materials.
10. Determination of intrinsic viscosity (I.V) of raw materials and its significance

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Syllabus

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

3PT4-: SYNTHESIS & POLYMERIZATION ENGINEERING LAB

Credit: 2
0L+0T+4P

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

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 .

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

3PT4:- DBMS LAB

Credit: 2
0L+0T+4P

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

List of Experiment

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 data base 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 students will chose one problem. The implementation shall being 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

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

3PT7-: INDUSTRIAL TRAINING	
Credit: 1.0	Max. Marks:50

Students has to undergo mandatory 15 days In-house/Industry training after II semester. Training examination will be held in III semester

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

3PT8--: SOCIAL OUTREACH, DISCIPLINE & EXTRA CURRICULAR ACTIVITIES (SODECA)	
Credit: 0.5	Max. Marks:25

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Syllabus

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

4PT2-01: DATA ANALYTICS

Credit: 2
2L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Multivariate Statistics -Degree of Relationship among Variables-Review of Univariate and Bivariate Statistics-Screening Data Prior to Analysis-Missing Data, Outliers, Normality, Linearity, and Homoscedasticity.	4
3	Multiple Regression - Linear and Nonlinear techniques- Backward Forward-Stepwise- Hierarchical regression-Testing interactions (2way interaction) - Analysis of Variance and Covariance (ANOVA & ANCOVA) - Multivariate Analysis of Variance and Covariance (MANOVA & MANCOVA).	6
4	Logistic regression: Regression with binary dependent variable - Simple Discriminant Analysis- Multiple Discriminant analysis Assessing classification accuracy- Conjoint analysis (Full profile method).	5
5	Principal Component Analysis -Factor Analysis- Orthogonal and Oblique Rotation-Factor Score Estimation-Multidimensional Scaling- Perceptual Map-Cluster Analysis (Hierarchical Vs Nonhierarchical Clustering).	5
6	Latent Variable Models 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.	5
	TOTAL	26

Text Books:

1. Goon, Gupta and Das Gupta, “Fundamentals of Statistics, World Press Private Ltd., 2013.
2. Gupta and Kapoor, “Applied statistics”, Sultan Chand & Sons, 2014.

Reference Books:

1. D.C. Montgomery, E.A. Peck, G.G. Vining, Introduction to Linear Regression Analysis, Wiley India Pvt. Ltd, 2016.
2. T.W. Anderson, “An Introduction to Multivariate Statistical Analysis, Wiley Pvt. Ltd., 2009.

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Syllabus

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

4PT1-02/4PT1-03: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit: 2
2L+0T+0P

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

SN		Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic economic concepts- 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.	4
3	Demand and Supply analysis- 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.	5
4	Production and Cost analysis- 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.	5
5	Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	Financial statement analysis- 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.	7
	TOTAL	26

Text Books:

1. E. Kreyszig, “Advanced Engineering Mathematics”, Wiley India Pvt. Ltd, 2021.
2. B.V. Ramana, “Higher Engineering Mathematics”, McGraw-Hill, 2017.
3. Goon, Gupta and Das Gupta, “Fundamentals of Statistics”, World Press Pvt. Ltd, 2013.

Reference Books:

1. M. K. Jain, S.R.K. Iyengar and R.K. Jain, “Numerical Methods”, New Age International Private Ltd, 2021.
2. S.S.cSastry, “Introductory Methods of Numerical analysis”, Prentics Hall India Learning Private Ltd, 2012.
3. S.L. Ross, “Differential Equation”, Wiley India Pvt. Ltd., 2016
4. S.C. Gupta & V.K. Kapoor, “Fundamentals of Mathematical statistics”, Sultan Chand & Sons, 2014.

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

4PT1-02/4PT1-02: TECHNICAL COMMUNICATION

Credit: 2
2L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Technical Communication- 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.	4
3	Comprehension of Technical Materials/Texts and Information Design & development- 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.	6
4	Technical Writing, Grammar and Editing- 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.	7
5	Advanced Technical Writing- 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.	8
	Total	26

Text Books:

1. Gajendra Singh Chauhan, L. Thimmesha and Smita Kashiramka, "Technical communication", Cengage learning India Private Ltd., 2019.

Reference Books:

1. Meenakshi Raman and Sangeeta Sharma, "Fundamental of Technical Communication", Oxford University Press, 2014.
2. M. Ashraf Rizvi, "Effective Technical Communication", McGraw Hill Education 2nd Ed., 2017.
3. Kavita Tyagi and Padma Misra, "Basic Technical communication", Prentice Hall India Learning Pvt. Ltd., 2011.
4. Phillip A. laplante, "Technical writing: A practical guide for engineers and scientists", CRC Press, 2011.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

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

4PT3-04: PRINCIPLES OF CHEMICAL ENGINEERING

Credit: 3
3L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
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 Poisuille 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:

1. W.L .Mc Cabe, J.C. Smith, "Unit Operations of Chemical Engineering", McGraw-Hill 7th Ed., 2014.
2. Shri. K.A. Gavhane, "Unit Operations I & II", Nirali Prakashan Publication, 2015.

Reference Books:

1. Richardson and Coulson, "Chemical Engineering", Vol. 1, Elsevier 6th Ed., 2006.
2. Richardson and Coulson, "Chemical Engineering", Vol. 2, Elsevier 5th Ed., 2006.
3. Chemical Engineer's handbook - Perry and Chilton. McGraw-Hill 8th Ed., 2008.
4. W.L. Badger, J.T. Banchemo. "Introduction to Chemical Engineering", McGraw-Hill, UK 1st Ed., 2002.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

4PT4-05: FLUID MECHANICS

Credit: 3
3L+0T+0P

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
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:

1. R. K. Bansal, "A Textbook of Fluid mechanics and Hydraulic Machines", Laxmi Publications 10th Ed., 2018.
2. P.N. Modi & S.M. Seth, "Fluid Mechanics and hydraulic machines", Standard Book House Since 1960 21st Ed., 2018.
3. S. Ramamrutham, "Hydraulics fluid machines and fluid machines", Dhanpat Rai Publishing Company Private Limited-New Delhi; 9th Ed., 2014.

Reference Books:

1. A.K. Mohanty, "Fluid Mechanics", PHI Pvt Ltd., 2006
2. Philip J. Pritchard, "Fox and McDonald's Introduction to Fluid Mechanics", Wiley 8th Ed., 2010.
3. Kundu Cohen, "Fluid Mechanics", Elsevier India, 2016.
4. G.K. Batchelor, "An Introduction to Fluid Dynamics", Cambridge University Press 2nd Ed., 2000.
5. R.J. Garde, "Engineering Fluid Mechanics", Scitech Publication, 2010.
6. J.F. Douglas, J.M. Gasiorek, J.A. Swaffield and L.B. Jack, "Fluid Mechanics", Pearson PH 5th Ed., 2005.

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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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Conduction: 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.	8
3	Convection: 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	8
4	Condensation and Boiling: 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.	8
5	Radiation: 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.	8
6	Heat Exchangers Classification of heat exchangers; Overall heat transfer coefficient, fouling factor calculations; Analysis of Heat Exchangers: Logarithmic Mean temperature difference, Effectiveness– NTU Method.	7
Total		40

Text Books:

1. Frank P. Incropera & David P. DeWitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons; 4th Ed., 2011.
2. R.C.Sachdeva, "Fundamentals of Engineering Heat and Mass Transfer", New Age International Publishers, 4th Ed., 2017.
3. Necati Ozisik, "Heat Transfer: A Basic Approach", McGraw-Hill Education, 1984.

Reference Books:

1. P.S. Ghosdastidar, "Heat Transfer", Oxford University Press 2nd Ed., 2012.
2. P.K. Nag, "Heat Transfer", McGraw-Hill Education, 2007.
3. A.F.Mills and V.Ganesan, "Heat Transfer", Pearson India 2nd Ed., 2009.
4. S.C. Arora, S. Domkundwar and Anand V. Domkundwar, "A course in Heat and Mass Transfer" Dhanpat Rai & Co.(P) Ltd-Delhi, 2007.
5. Jack Holman, "Heat Transfer", McGraw-Hill Education 10th Ed., 2009.
6. S.P. Sukhatme, "A text book on Heat Transfer", University Press 4th Ed., 2005.
7. Venkateshan, "Heat Transfer, ANE Books, 2009.
8. Donald Pitts & Leighton E. Sissom, "Schaum's outline of Heat Transfer", McGraw-Hill Education 2nd Ed., 2011.
9. R.S. Yadav, "Heat and Mass Transfer", Central Publishing House, 1992.

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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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Engineering Plastics – I Preparation- properties - and applications: Styrene copolymers–High Impact Polystyrene (HIPS), Acrylonitrile Butadiene Styrene (ABS), Styrene acrylonitrile (SAN), Acrylic plastics-Polymethyl 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, Polyacetals.	8
4	Specialty and High Performance Plastics Preparation-properties-and applications: Aromaticether-Polyphenylene oxide (PPO), Aromaticthioether-Polyphenylenesulphide (PPS), Polysulfone, Aromatic polyamides. Preparation-properties-and applications: Polyimides (PI) Polyamideimide (PAI), Polyimidazoles, Fluoropolymers–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: Preparation- properties and applications of Biodegradable polymers–poly ϵ -caprolactone-poly lactic acid-Bacterial polyhydroxyalkonates–polyvinylpyrrolidone–polyacrylic acid and its homolog's–polyacrylamide–polyethylene oxide–polyethylene amine-Polyvinyl alcohol	6
	Total	36

Text Books:

1. J. A. Brydson, “Plastic Materials”, Butterworth-Heinemann 7th Ed., 1999.
2. Irvin I. Rubin, “Hand Book of Plastic Materials and Technology”, Wiley-Blackwell, 1990.
3. Manas Chanda, “Plastics Technology Hand book”, CRC Press 5th Ed., 2017.
4. Matrín Goosey, “Plastics for Electronics”, Springer 2nd Ed., 1999.
5. R.W. Dyson, “Specialty Polymers”, Springer, 2012.

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

Reference Books:

1. Berins, Michael L, SPI Plastics Engineering Hand Book of the Society of the Plastic Industry, INC, Springer, 1994.
2. S.S. Schwartz, “Plastics Materials and Processes”, Van Nostrand Reinhold company, 1982.
3. Birley and Scott, “Plastics Materials-Properties and Application”, Springer,1988.
4. Charles A. Harper, “Modern Plastics Hand Book”, McGraw-Hill Education, 2000.
5. Michel Biron, “Thermoplastics and Thermoplastic Composites: Technical Information for Plastics Users, Elsevier Science, 2007.
6. P. DuBois, “Plastics in Agriculture”, Applied Science Publishers, London, 1978.
7. Johannes Karl Fink, “Handbook of Engineering and Specialty Thermoplastics’, Volume 10, Water Soluble Polymers, John Wiley & Sons, New Jersey, 2011.
8. David Kaplan, “Biopolymers from renewable resources”, Springer, 1998.



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Syllabus

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

4PT4-: CHEMICAL ENGINEERING LAB

Credit: 1.5
0L+0T+3P

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.

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Syllabus

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

4PT4-: FLUID MECHANICS LAB

Credit: 1.5

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

0L+0T+3P

List of Experiment

1. Reynolds experiment for Laminar, transitional and turbulent flow identification, through Reynolds apparatus.
2. Verification of Bernoulli's Equation through Bernoulli's Theorem Apparatus.
3. Determination of coefficient of Discharge for Orifice, Venturimeter through Venturimeter and orifice meter test rig.
4. Estimation of losses through pipe fitting, sudden enlargement and contraction frictional Pressure drop in Circular pipes.
5. Verification of Darcy's Law through Darcy apparatus.
6. To Study Construction, Working of Centrifugal, Reciprocating, Gear and Plunger Pumps through test rig.
7. To Study pitot tube apparatus and cavitation apparatus in a pipe flow.

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Syllabus

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

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.

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Syllabus

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

4PT4-: PLASTICS MATERIAL TESTING LAB-I

Credit: 1.5
0L+0T+3P

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

List of Experiment

1. Determination of Ash Content in plastics materials.
2. Determination of Filler content in plastics materials.
3. Determination of Melt flow index of plastics materials.
4. Determination of Optical properties of plastics materials.
5. Determination of Thermal Properties of plastics materials.
6. Determination of Electrical Properties of plastics materials.
7. Study of weathering properties of plastics materials.
8. Determination of Density of plastic materials.
9. Compounding or Blending using two roll mill
10. Specimen preparation using contour cutter.
11. Determination of Bulk density for powder materials.
12. Study of impact strength of plastics materials.

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

4PT8--: SOCIAL OUTREACH, DISCIPLINE & EXTRA CURRICULAR ACTIVITIES (SODECA)	
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Credit: 0.5	Max. Marks:25
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