# ANNA UNIVERSITY:: CHENNAI 600 025

## UNIVERSITY DEPARTMENT

R – 2012

## B.TECH. RUBBER AND PLASTICS TECHNOLOGY

I – VIII SEMESTERS CURRICULA AND SYLLABI

### SEMESTER - I

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* Four weeks of training during 6th semester Vacation

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<td>Entrepreneurship Development</td>
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<td>PR8452</td>
<td>Machine Components Design</td>
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**Total No. of Credits : 177**
OBJECTIVES:

• To enable all students of engineering and technology develop their basic communication skills in English.

• To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.

• To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.

• To inculcate the habit of reading for pleasure.

UNIT I
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one’s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association; E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III
Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause
& effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV
Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V
Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters.

TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES

EXTENSIVE READERS

Website Resources
1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com

MA 8151 MATHEMATICS – I L T P C 3 1 0 4

OBJECTIVES
1. To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
2. To make the student knowledgeable in the area of infinite series and their convergence so that he/she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
3. To familiarize the student with functions of several variables. This is needed in many branches of engineering.
4. To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
5. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES 9+3
UNIT II  INFINITE SERIES  9+3
Sequences – Convergence of series – General properties – Series of positive terms –Tests
of convergence (Comparison test, Integral test, Comparison of ratios and D’Alembert’s ratio
test) – Alternating series – Series of positive and negative terms –Absolute and conditional
convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  9+3
Limits and Continuity – Partial derivatives – Homogeneous functions and Euler’s theorem
– Total derivative – Differentiation of implicit functions – Change of variables –Jacobians –
Partial differentiation of implicit functions – Taylor’s series for functions of two variables –
Errors and approximations – Maxima and minima of functions of two variables – Lagrange’s
method of undetermined multipliers.

UNIT IV  IMPROPER INTEGRALS  9+3
Improper integrals of the first and second kind and their convergence – Evaluation of integrals
involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation
of integrals using Beta and Gamma functions – Error functions

UNIT V  MULTIPLE INTEGRALS  9+3
Double integrals – Change of order of integration – Double integrals in polar coordinates –
Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in
double and triple integrals – Area of a curved surface.

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I   PROPERTIES OF MATTER


UNIT II   ACOUSTICS AND ULTRASONICS


UNIT III   THERMAL PHYSICS


UNIT IV   APPLIED OPTICS

Interference - Michelson interferometer: construction, working, determination of wave length
and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein’s coefficients - CO2, Nd:YAG and semiconductor lasers - homo junction and hetero junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V  SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE BOOKS

CY8151  ENGINEERING CHEMISTRY  L T P C
(Common to All Branches of Engineering and Technology)  3 0 0 3

UNIT I  CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II  POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of
polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT V NANOCHEMISTRY

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

GE8151 COMPUTING TECHNIQUES

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV FUNCTIONS AND POINTERS

UNIT V STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS
TEXTBOOKS

REFERENCES

GE 8152 ENGINEERING GRAPHICS L T P C 2 0 3 4

OBJECTIVES
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
• To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination) 1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 5+9

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects
UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES  
5+9
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS  
5 + 9
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES  
5+9
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS  
6 + 9
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids- Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (Demonstration Only)  
3
Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

TEXT BOOK

REFERENCES

Publication of Bureau of Indian Standards

Special points applicable to University Examinations on Engineering Graphics
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH 8161

PHYSICS LABORATORY (Common to all branches of B.E. / B.Tech. Programmes)

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1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non–uniform bending - Determination of young’s modulus
3. Lee’s disc - Determination of thermal conductivity of a bad conductor
4. Potentiometer – Determination of thermo e.m.f. of thermocouple
5. Air wedge – Determination of thickness of a thin sheet of paper
6. i. Optical fibre - Determination of Numerical Aperture and acceptance angle
   ii. Compact disc – Determination of width of the groove using laser
7. Acoustic grating - Determination of velocity of ultrasonic waves in liquids
8. Post office box – Determination of Band gap of a semiconductor
9. Spectrometer – Determination of wavelength using grating
10. Viscosity of liquids – Determination of coefficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS

CY 8161 CHEMISTRY LABORATORY 
L T P C 
(Common to all branches of Engineering and Technology) 0 0 2 1

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by lodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer
(1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

REFERENCES
LIST OF EXPERIMENTS:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL : 45 PERIODS

OBJECTIVE
To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE

Plumbing
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Laying pipe connection to the suction side of a pump – inlet.

Laying pipe connection to the delivery side of a pump – outlet.

Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
Wood Work
Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

Study
Study of joints in door panels, wooden furniture
Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE
Basic household wiring using switches, fuse, indicator – lamp etc.,
Preparation of wiring diagrams
Stair case light wiring
Tube – light wiring
Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICE

Welding
Arc welding of butt joints, lap joints, tee joints
Gas welding Practice.

Basic Machining
Simple turning, drilling and tapping operations.
Machine assembly Practice.
Study and assembling the following:
Centrifugal pump, mixies and air conditioners.

Demonstration on
(a) Smithy operations like the production of hexagonal bolt.
(b) Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE
Soldering simple electronic circuits and checking continuity.
Assembling electronic components on a small PCB and testing.
Study of Telephone, FM radio, low-voltage power supplies.

TOTAL: 45 PERIODS
OBJECTIVES

• To make the students acquire listening and speaking skills meant for both formal and informal contexts

• To help them develop their reading skills by exposing them to different types of reading strategies

• To equip them with writing skills needed for academic as well as workplace situations

• To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using ‘emoticons’ as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. ‘can’) - Homophones (e.g. ‘some’, ‘sum’); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one’s friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students’ dialogues.

UNIT III

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning.
- Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. ‘rock’, ‘train’, ‘ring’); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV 9 + 3
Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V 9 + 3
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

EXTENSIVE READERS

WEB RESOURCES
1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA8251 MATHEMATICS II L T P C (Common to all branches of B.E. / B.Tech. Programmes in II Semester ) 3 1 0 4

OBJECTIVES
• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
• To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
• To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
• To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I  DIFFERENTIAL EQUATIONS  9+3
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT II  VECTOR CALCULUS  9+3
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III  ANALYTIC FUNCTION  9+3
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions w= z+ c, az, 1/z, z2- Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  9+3

UNIT V  LAPLACE TRANSFORMS  9+3

TOTAL : 60 PERIODS

TEXT BOOKS
REFERENCES

PH8201 MATERIALS SCIENCE FOR TECHNOLOGISTS L T P C 3 0 0 3

UNIT I MATERIALS PREPARATION AND PROCESSING 9

UNIT II CONDUCTING MATERIALS 9
Classical free electron theory of metals - Schrödinger wave equation - Time independent and time dependent equations. Physical significance of wave function, particle in a box (in one dimension) – electrons in a metal - Fermi distribution function – Density of energy states – effect of temperature on Fermi energy, Superconducting Phenomena, Properties of superconductors – Meissner effect and Isotope effect. Type I and Type II superconductors, High Tc superconductors – Magnetic levitation and SQUIDS.

UNIT III SEMICONDUCTING MATERIALS 9
Origin of band gap in solids (qualitative) - Concept of effective mass of electron and hole – Carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – Variation of Fermi level with temperature – electrical conductivity – Band gap determination – Carrier concentration in n-type and p-type semiconductors (derivation) – Variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – Solar cells.
UNIT IV  MAGNETIC AND DIELECTRIC MATERIALS  

UNIT V  NEW MATERIALS AND APPLICATIONS  

TOTAL: 45 PERIODS

REFERENCES

CY8254  PHYSICAL AND ORGANIC CHEMISTRY  

UNIT I  CHEMICAL KINETICS AND CATALYSIS  
Chemical Kinetics – Order – Molecularity – Rate of reaction – Activation energy – Polymerization kinetics – Catalysis – Surface science – Application of catalysis – Phase rule - applications.

UNIT II  ELECTRO CHEMISTRY / CORROSION  
Electro Chemistry – Electrochemical series – Transport numbers and ionic mobility – Buffer

UNIT III  STRUCTURE AND REACTIVITY IN ORGANIC COMPOUNDS  9
Bonding in Organic Compounds- Structure-property relationships - Electronic effects like inductive, mesomeric, electromeric and hyper conjugation effects – Free radicals, carbbocations, carbanions, elementary ideas about stereo chemistry.

UNIT IV  DETAILS OF REACTION MECHANISMS  9
Free radical substitutions, Electrophilic addition, Aromatic Electrophilic substitutions, Nucleophilic additions, condensation reactions, nucleophilic substitutions in aliphatic and aromatic compounds, cyclo additions, rearrangements, uses of these reactions in polymer preparation.

UNIT V  ORGANIC SUBSTANCES OF IMPORTANCE TO POLYMER TECHNOLOGY  9
Amines, heterocyclic compounds – furan, thiophene, pyrrole, pyridine, quinoline, iso quinoline, imidazoles, thiazolesPreparation , properties and uses of simple monomers like ethylene, propylene, isobutylene, butadiene, styrene, methyl methacrylate , diisocyanates, glycols, polyols, epichlorohydrin, fluoro alkenes, acrylonitrile, vinyl chloride, vinyl acetate.

TOTAL : 45 PERIODS

REFERENCES

GE8251  ENGINEERING MECHANICS  L T P C
3 1 0 4

OBJECTIVE
• To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering
UNIT I  BASICS AND STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12

UNIT IV  DYNAMICS OF PARTICLES  12

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL : 60 PERIODS
TEXT BOOKS

REFERENCES

PR8251 CONVENTIONAL MACHINING PROCESSES L T P C
3 0 0 3

OBJECTIVE
• To impart the knowledge on basic concepts of various machining Processes and Machine tools.
• Classes to be supported by demonstration in the workshop and screening of video film of the various operations of the machines.

UNIT I LATHE
UNIT II SHAPER, PLANER & SLOTTER


UNIT III DRILLING


UNIT IV MILLING


UNIT V GRINDING


TOTAL: 45 PERIODS
TEXT BOOK

REFERENCES

CY8261 APPLIED CHEMISTRY LABORATORY L T P C
0 0 2 1

LIST OF EXPERIMENTS
1. Preparation of solutions with various normality and molarity.
2. Determination of Redwood / Saybolt numbers, kinematic viscosity and viscosity index of lubricating oils
3. Determination of flash point, fire point, cloud and pour point of oils
4. Determination of acid value, saponification number and iodine value of oils
5. Determination of total, temporary, permanent, calcium and magnesium hardness of water samples
6. Determination of chloride, sulphate ,and COD of water samples
7. Determination of purity of washing soda and strength of a commercial acid
8. Estimation of available chlorine in hypochlorite solution
9. Estimation of strength of hydrogen peroxide
10. Synthesis of a dye, preparation of soap and a defoamer

TOTAL : 30 PERIODS
LIST OF EXPERIMENTS:
1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

TOTAL: 45 PERIODS

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Terminals with C and C++ Compiler

MA8356  PROBABILITY AND STATISTICS  L T P C
3 1 0 4

OBJECTIVES
• To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
• The Students will have a fundamental knowledge of the concepts of probability.

UNIT I  RANDOM VARIABLES  9+3
Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES  9+3
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).
UNIT III  TESTS OF SIGNIFICANCE  9+3

UNIT IV  DESIGN OF EXPERIMENTS  9+3
Completely randomized design – Randomized block design – Latin square design - 22 -factorial design - Taguchi’s robust parameter design.

UNIT V  STATISTICAL QUALITY CONTROL  9+3
Control charts for measurements ( and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE:

- To gain knowledge of simple stresses, strains and deformation in components due to external loads.
- To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both.
- Effect of component dimensions and shape on stresses and deformations are to be understood.
- The study would provide knowledge for use in the design courses

To provide knowledge on analysis of various structural elements for different loading conditions.

UNIT I  AXIAL LOADING


UNIT II  STRESSES IN BEAMS

Shear force & bending moment diagrams for simply supported and cantilever beam – bending stresses – shear stress variation in beams of symmetric sections – beams of uniform strength.

UNIT III  DEFLECTION OF BEAMS


UNIT IV  TORSION – SPRINGS

Torsion of solid and hollow circular shafts – shear stress variation – power transmission in shafts – combined bending, torsion and axial loading of circular shafts – open and closed-coiled helical springs – stresses in helical springs – design of close coiled helical spring.

UNIT V  BIAXIAL STRESSES

Stresses in thin-walled pressure vessels – Mohr’s circle and its construction – determination of principal stresses and principal plane.

TOTAL : 45 PERIODS
TEXTBOOKS

REFERENCES

EE8252  PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING   L T P C
3 0 0 3

UNIT I  ELECTRICAL CIRCUITS  9
Basic principles involved in power generation, transmission and use – Ohms Law Kirchoff’s Law – steady state solution of DC circuits – Theorem: Thevinin’s, Norton’s and Superposition Theorems.

UNIT II  AC CIRCUITS  9
Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits, housing wiring, industrial wiring, materials of wiring.

UNIT III  ELECTRICAL MACHINES  9

UNIT IV  ELECTRONIC DEVICES & CIRCUITS  9
UNIT V  MEASUREMENTS & INSTRUMENTATION

Introduction to transducers: pressure, temperature, position, electrical measurements
- Classification of instruments – moving coil and moving iron, Ammeter and Voltmeter – multimeters – dynamometer type Wattmeter – three-phase power measurements – energy meter – megger – instrument transformer (CT and PT)

TOTAL : 45 PERIODS

REFERENCES

RP8301  FUNDAMENTALS OF CHEMICAL ENGINEERING OPERATIONS  L T P C
3 0 0 3

UNIT I  HEAT TRANSFER

UNIT II  MASS TRANSFER
UNIT III  AGITATION AND MIXING
Agitation of liquids – Types of impellers, Selection criteria, Power consumption calculations for agitated vessel Absorption – Principle and equipment (packed towers and plate columns). Adsorption – Principles and equipment for adsorption

UNIT IV  DRYING
Drying – Principles and definitions, Rate of batch drying, Equipments for drying. Humidification – Humidity and saturation, dry bulb and wet bulb temperatures, percentage saturation, dew point, humid volume, humid heat, enthalpy, Equipment — cooling towers, spray chambers-Water technology.

UNIT V  SEPARATION PROCESSES

TOTAL : 45 PERIODS

REFERENCES

RP8302 POLYMER CHEMISTRY L T P C 3 0 0 3

UNIT I  INTRODUCTION
History of Macromolecules – Difference between simple organic molecules and macromolecules - Monomers – Functionality – Classifications of Polymers – Natural and synthetic polymers – Structure of natural rubber and proteins
UNIT II  ADDITION POLYMERIZATION  
Polymerization mechanism- Initiation – Types of initiation – Free radical polymerization –
Metallocene polymers - Cationic polymerization – Anionic polymerization – Coordination
polymerization – Industrial polymerization – Bulk, emulsion, suspension and solution
polymerization techniques – Copolymerization -Kinetics -Copolymer equation-Types of
copolymers

UNIT III  STEP GROWTH POLYMERIZATION  
Flory’s equal reactivity principle – Extension of condensation reactions to polymer synthesis –
Polycondensation – Kinetics of polycondensation- Carother’s equation – Linear polymers by
polycondensation – Interfacial polymerization – Crosslinked polymers by condensation – Gel
point –Examples - Moulding powders

UNIT IV  SOLUTION PROPERTIES OF POLYMERS  
Polymer Dissolution - Difference between simple solutions and polymer solutions – Molecular
Weight - Average molecular weight – Degree of polymerization and molecular weight –
Molecular weight distribution – Polymer fractionation-Polydispersity – Molecular weight
determination. Different methods – Gel Permeation Chromatography – Osmometry, Light
Scattering – Basic Principles

UNIT V  DIMENSIONS OF MACROMOLECULES  
Size and shape of the macromolecules – Solubility parameter – Polymer/solvent interaction
parameter – Flory Huggins Theory of Polymer Solutions – Thermodynamics of Polymer
dissolution - Theta temperature – Size and molecular weight of polymer from the solution
properties of polymers

TOTAL : 45 PERIODS

REFERENCES
UNIT I  BASIC THERMODYNAMICS  16

UNIT II  AIR CYCLE AND STEAM  12

UNIT III  BASIC CONCEPTS OF FLUID MECHANICS  12

UNIT IV  BASIC EQUATIONS OF FLUID FLOW ANALYSIS  12

UNIT V  INCOMPRESSIBLE INVISCID FLOW  8
Euler’s equations of motion – Bernoulli’s equations – Applications – Methods of pressure measurement – Flow measurement – Orifice plate – Venturi meter – Irrotational flow – Stream function and velocity potential – Laplace equation – Elementary plane flows

TOTAL : 60 PERIODS

REFERENCES

AU8312
MECHANICAL SCIENCES LABORATORY

L T P C
0 0 3 2

OBJECTIVE
To train the students in testing and quantifying the mechanical properties of Engineering Materials, Engines.

LIST OF EXPERIMENTS

Material Testing Lab
- Tension Test
- Torsion Test
- Testing of springs
- Impact test i) Izod ii) Charpy
- Hardness test i) Vickers ii) Brinell iii) Rockwell iv) Shore
- Deflection of Beams
- Dye Penetrant Test
- Tensile testing of polymers.
- Flex Fatigue test for Elastomers.
- Injection moulding machine operation.

IC Engines Lab
- Performance test on a 4 stroke engine
- Viscosity determination of the given fluid
- Moment of inertia of connecting rod
- Determination of Effectiveness of a parallel and counter flow heat exchangers.
- Valve timing of a 4 stroke engine and port timing of a 2 stroke engine.
- Determination of Flash point and Fire point of the given oil.

TOTAL : 45 PERIODS
LIST OF EXPERIMENTS

1. Study of DC & AC Starters
2. Wheatstone Bridge and Schering Bridge
3. Speed Control of DC Shunt Motor
4. Load Test on DC Shunt Motor
5. OCC & Load Characteristics of DC Shunt Generator
6. Load Test on Single-Phase Transformer
7. Load Test on Three-Phase Induction Motor
8. Load Test on Single-Phase Induction Motor
9. Study of Transducers
10. ADC and DAC Converters

TOTAL : 45 PERIODS

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

UNIT II INTERPOLATION AND APPROXIMATION 9+3
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3
UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS


UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

REFERENCES


GE8351  ENVIRONMENTAL SCIENCE AND ENGINEERING

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic
ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity
definition: genetic, species and ecosystem diversity – biogeographical classification of India
– value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option
values – Biodiversity at global, national and local levels – India as a mega-diversity nation –
hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife
conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ
and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II   ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c)
Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards
– soil waste management: causes, effects and control measures of municipal solid wastes –
role of an individual in prevention of pollution – pollution case studies – disaster management:
floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III   NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction,
mapping, dams and their effects on forests and tribal people – Water resources: Use and over-
utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits
and problems – Mineral resources: Use and exploitation, environmental effects of extracting
and using mineral resources, case studies – Food resources: World food problems, changes
caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide
problems, water logging, salinity, case studies – Energy resources: Growing energy needs,
renewable and non renewable energy sources, use of alternate energy sources. case studies
– Land resources: Land as a resource, land degradation, man induced landslides, soil erosion
and desertification – role of an individual in conservation of natural resources – Equitable use
of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill /
mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy –
water conservation, rain water harvesting, watershed management – resettlement and

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT  6


TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCE BOOKS

RP8401          PHYSICAL PROPERTIES OF POLYMERS      L T P C
                              3 0 0 3

UNIT I  STATES OF AGGREGATION IN POLYMERS  12

Transitions and segmental mobility in polymers – Glass transition, Tg, and flexibility – Multiple transitions in polymers - Significance of transition temperatures – Semicrystalline polymers
– Effect of crystallization on properties of polymers – Factors affecting crystallization crystal nucleation and growth – relationship between Tg and Tm – Relationship between properties and crystalline structure- Melting of polymers – Rheology of Polymer melts.

UNIT II  DEFORMATION & STRENGTH PROPERTIES OF POLYMERS  12

UNIT III  FRICTION AND WEAR IN POLYMERS  7

UNIT IV  ELECTRICAL PROPERTIES OF POLYMER  5

UNIT V  OPTICAL PROPERTIES OF POLYMERS  9

TOTAL : 45 PERIODS

REFERENCES
UNIT I  INTRODUCTION TO PLASTICS  12
Plastics – Classification – Structure – Property relationship (effect on thermal, mechanical, optical, chemical, electrical properties)

UNIT II  OLEFINIC PLASTICS  12
Manufacturing methods – structure / property relationships, processing & applications of PE, PP & Copolymers of PE & PP.

UNIT III  STYRENICS & ACRYLICS  12
Styrenics : Manufacturing methods – Structure / property relationship, processing & applications of PS, SAN, ABS, HIPS & EPS.

Acrylics: Manufacturing Methods – Structure / property relationship processing & applications of PAN, PMMA & their copolymers

UNIT IV  PVC TECHNOLOGY  12
Manufacturing, Structure / property relationship, additives for PVC - Processing applications of pPVC, uPVC,, PVC pastes, co polymers of PVC, blends & alloys of PVC, Testing of PVC resin, PVC compounds & Products

UNIT V  THERMOSETS & NATURAL POLYMERS  12
Natural Polymers – Cellulose, starch, proteins, RNA,DNA – Properties & applications.PF, UF & MF resins – preparation, properties & uses moulding powders – additives , epoxy, unsaturated polyester resins

REFERENCES
UNIT I  STRUCTURE-PROPERTY RELATIONSHIPS IN RUBBERS 9
Rubber Elasticity – Requirements for rubber elasticity – Effect of chemical structure on the performance properties of rubbers – Effect of structure on processing properties of elastomers

UNIT II  GENERAL PURPOSE RUBBERS 9
Natural Rubber- Origin – Natural Rubber Latex, tapping, processing, properties and applications – Conversion of Latex into dry rubber – Properties of dry rubber – Classification based on technical specifications – Modifications of Natural Rubber– Synthetic polyisoprene-Polybutadiene and SBR-Their manufacture, structure-property considerations- processing and curing of these rubbers-uses of these rubbers

UNIT III  SPECIAL PURPOSE RUBBERS 20

UNIT IV  COMPOUNDING AND ADDITIVES FOR VULCANIZATION 8
Order of mixing- vulcanization agents-Their mechanisms of action-Accelerators and activators-Other cure systems

UNIT V  FILLERS AND OTHER ADDITIVES 14
Carbon black -Its preparation, structure, properties and their effect on rubber properties-silica fillers-coupling agents- other fillers-Processing aids-Anti oxidants and antiozonants-Other additives like colourants, blowing agents, factice, reclaimed rubbers.

TOTAL : 60 PERIODS

REFERENCES

RP8404 THEORY OF MACHINES AND MECHANISMS L T P C 3 1 0 4

UNIT I MECHANISMS 14

UNIT II FRICTION 12
Types of friction – Friction in screw and nut – Screw jack – Pivot, collar and thrust bearings – Plate and cone clutch – belt (flat & vee) and rope drives – Creep in belts – Open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – condition for maximum power transmission.

UNIT III GEARING AND CAMS 12

UNIT IV BALANCING 11
Static and dynamic balancing – Single and several masses in different planes – Primary and secondary balancing of reciprocating masses – Balancing of single and multi cylinder engines – Governors and Gyroscopic effects.

UNIT V VIBRATION 11

TOTAL : 60 PERIODS
REFERENCES

RP8411 COMPUTER AIDED PARTS & ASSEMBLY DRAWING L T P C
0 0 4 2

DRAWING
Train the students to allocate geometrical tolerances and to develop part drawing

COMPUTER AIDED PRODUCTION DRAWING AND MODELING
Detailed part drawing and assembly drawings (with suitable tolerances, machine symbols, specification of fit).

1. Screw jack
2. Plummer block
3. Machine vice
4. Four jaw chuck of lathe
5. Universal coupling
6. Hydraulic & Pneumatic Assembly

COMPUTER AIDED ANALYSIS

TOTAL : 45 PERIODS
REFERENCES


RP8412 POLYMER SYNTHESIS AND IDENTIFICATION LABORATORY L T P C

0 0 4 2

LIST OF EXPERIMENTS

1. Identification of Plastics materials.

2. Density determination.

3. Bulk polymerization - Preparation of Polymethyl methacrylate.

4. Solution Polymerization - Preparation of polyacrylamide.

5. Preparation of Phenol-Formaldehyde, UF and MF resins.


7. End group analysis.

8. Determination of acid value of a resin.

9. Study of Molecular weight distribution (GPC).

10. Determination of cure of a phenolic moulding (percentage acetone soluble matter).


TOTAL : 60 PERIODS

RP8501 ENGINEERING AND HIGH PERFORMANCE PLASTICS L T P C

3 0 0 3

UNIT I ADDITIVES FOR PLASTICS-I

UNIT II  ADDITIVES FOR PLASTICS – II  9
Blowing agents, UV stabilizer, antistatic agents, anti blocking agents – Slip & antislip agents – Processing aids, mould releasing agents

UNIT III  ENGINEERING PLASTICS  9
Polyamides, (nylons), modified polyamides, polyesters – PET, PBT, Polyacetals, PC and its blends – Preparation, properties & applications, LCP’s

UNIT IV  HIGH TEMPERATURE PLASTICS  9
Fluorine containing Plastics – Preparation, properties & uses of PTFE, PCTFE, PVDF, other high performance plastics like PPO, PPS, polysulphones, PEEK, Polyimides, Polybenzimidazoles, aromatic polyamides – Kevlar, Nomex – Preparation, properties & applications.

UNIT V  SPECIALITY POLYMERS  9
Polymers for electronic applications, conducting polymers – Photoresists, polymers in optoelectronics polymers with piezoelectric, pyroelectric & ferroelectric properties – Polymers in bio medical applications.

TOTAL : 45 PERIODS

REFERENCES

RP8502  PLASTICS PROCESSING AND MACHINERY  L T P C
3 0 0 3

UNIT I  MELT PROCESSING OF PLASTICS  9
Flow behavior – thermal behaviour, crystallization, orientation.

UNIT II  EXTRUSION PROCESS & BLOW MOULDING  9
Extruder components and their functions – Geometry & various types of extruder screws. Barrier screws, flow analysis with extruder, two stage, vented extruders; pipe extrusion –
Profile extrusion – Sheet extrusion, flat sheet extrusion – Blown film extrusion – Monofilament & fiber extrusion - Trouble shooting in extrusion operations


UNIT III  INJECTION MOULDING OF PLASTICS-I 9


UNIT IV  INJECTION MOULDING OF PLASTICS-II 9
Basic mould constructions, two plate, three plate mold – Runnerless, stack moulds, mould designs – Sprue, runner, gate systems, venting, mould cooling, estimation of mould filling and mold cooling- Orientation arising in moulding – Shrinkage in injection moulding.

UNIT V  THERMOFORMING, ROTATIONAL MOLDING AND FINISHING OF PLASTICS 9

TOTAL : 45 PERIODS

REFERENCES
5. The role of additives in plastics – L. MASCIA, Edward Arnold publication.
UNIT I INTRODUCTION

UNIT II PLASTICS TESTING- I

UNIT III PLASTICS TESTING- II

UNIT IV TESTS FOR RUBBER PROPERTIES

UNIT V DESTRUCTIVE AND DURABILITY TESTS IN ELASTOMER
Fatigue – Flex cracking and cut growth – Heat build up – Principle and applications. Effect of environment – Oxygen, heat, ozone and swelling media; Rubber to non-rubber substore adhesions – Product and standard methods of testing.

TOTAL : 60 PERIODS

REFERENCES
UNIT I  COMPOUNDING AND MIXING OPERATIONS  

UNIT II  FORMING OPERATIONS

UNIT III  MOULDING AND OTHER VULCANISING TECHNIQUES
Compression, transfer and injection moulding – Blanks & pre-heating techniques, preparation of surfaces for bonding. Curing: Autoclaves, Hot air chambers, curing of built up articles, continuous vulcanization, L.C.M. (Liquid Curing Media), Fluidized Bed, microwave curing. Hand building and forming equipment for tank, pipe lining, roller covering.

UNIT IV  FINISHING OF RUBBER COMPONENTS – SAFETY IN RUBBER MACHINERY

UNIT V  PROCESSING METHODS FOR VARIOUS RUBBER PRODUCTS

TOTAL : 45 PERIODS

REFERENCES

LIST OF EXPERIMENTS

1. Determination of T.S., D.R.C., V.F.A., number of Latex
2. Estimation of total alkalinity of the latex
3. Determination of volatile matter, dirt, ash content in Rubber from Natural sources
4. Estimation of Cu, Fe and Mn in rubber by colorimetry
5. Rubber identification pyrolysis and spot test by specific reagents
6. Soxhlet extraction – determination of total extractables
7. Rapid reflux extract
8. Chemical analysis of synthetic rubber components and vulcanisates
9. Determination of structure of carbon black
   (i) DBP absorption
   (ii) IAN
   (iii) Surface area Calculation
10. Estimation of total and free sulphur in rubber products
11. Estimation of process oils
    (i) Aniline point
    (ii) Flash point
    (iii) Viscosity
    (iv) Density etc.
14. TGA / DSC analysis of Rubber Compounds.

TOTAL: 60 PERIODS
The students will prepare using the rubber & rubber materials as appropriate using the process machinery and perform the tests for the properties as suggested in the following titles:

**Ex No:1**  Mixing behaviour of NR on two roll mill  
**Ex No :2**  Mixing study of carbon black filled NR  
**Ex No: 3**  Mixing study of carbon black filled SBR  
**Ex No: 4**  Mixing study of carbon black filled SBR & NR blend  
**Ex No: 5**  Mixing study of carbon black filled EPDM  
**Ex No: 6**  Mixing study of carbon black filled NBR  
**Ex No: 7**  Extrusion characteristics of a filled rubber mix- NR  
**Ex No: 8**  Extrusion characteristics of a filled rubber mix- SBR  
**Ex No: 9**  Extrusion characteristics of a filled rubber mix- NBR  
**Ex No: 10**  Extrusion characteristics of a filled rubber mix- EPDM  
**Ex No: 11**  Curing Process of Rubber Compound- NR filled  
**Ex No: 12**  Curing Process of Rubber Compound- SBR filled  
**Ex No: 13**  Curing Process of Rubber Compound- NBR filled  
**Ex no: 14**  Curing Process of Rubber Compound- EPDM filled

**RUBBER TESTING:**
1. The cured specimens prepared will be tested for hardness, resilience, tensile properties, tear strength, fatigue (crack initiation and propagation), abrasion resistance and hot air aging.  
2. In the testing, the students will be required to perform at least one set of testing for NR and a synthetic rubber.

**TOTAL : 60 PERIODS**

**MG8653**  
**PRINCIPLES OF MANAGEMENT**  
**L T P C**  
**3 0 0 3**

**AIM**
To learn the different principles and techniques of management in planning, organizing, directing and controlling.
OBJECTIVES

• To study the Evolution of Management
• To study the functions and principles of management
• To learn the application of the principles in an organization

UNIT I  INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS  9

UNIT II  PLANNING  9

UNIT III  ORGANISING  9

UNIT IV  DIRECTING  9

UNIT V  CONTROLLING  9
System and process of controlling –budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES

RP8601 MOULD ENGINEERING AND MANUFACTURE L T P C 3 0 0 3

UNIT I THEORY OF METAL CUTTING & LATHE MACHINES 9
Introduction: material removal processes, types of machine tools – Theory of metal Cutting - Chip formation, cutting tool materials, tool wear, tool life, surface finish, cutting fluids. Centre lathe - Various operations Capstan and turret lathes - Special attachments

UNIT II SPECIAL MACHINE TOOLS 9

UNIT III MOULD ENGINEERING AND MATERIALS FOR MOULD MANUFACTURING 9

UNIT IV UNCONVENTIONAL MACHINING PROCESSES 9
UNIT V  CNC MACHINE TOOLS AND PART PROGRAMMING  9

TOTAL : 45 PERIODS

REFERENCES

RP8602  POLYMER CARACTÉRISATION TECHNIQUES  L T P C
3 0 0 3

UNIT I  CHEMICAL METHODS  6
Identification of Olefins, Dienes and other vinyl Polymers by Chemical Methods – preliminary examination – Polymer identification through functional group reactions- Analysis of Natural rubber, synthetic rubber and different plastic materials-Microstructural characterization using X-ray diffraction, SEM, TEM and AFM

UNIT II  SPECTROSCOPIC CHARACTERIZATION OF POLYMERS  12
UNIT III  RHEOLOGICAL CHARACTERIZATION 9

UNIT IV  THERMAL ANALYSIS 12

UNIT V  CHROMATOGRAPHIC CHARACTERIZATION 6
Molecular weight distribution using GPC, HPLC– Biological Separations - Analysis of antioxidant, process oil and additives in Polymer Compounds –Analysis of Decomposition products using GC – Pyrolysis Gas Chromatography

TOTAL : 45 PERIODS

REFERENCES

RP8603  RUBBER COMPOUND AND PRODUCT DESIGN  L T P C
3 0 0 3

UNIT I  DESIGNING WITH RUBBER – FUNDAMENTALS 9
UNIT II  SERVICE CONDITIONS  9
Dynamic mechanical properties- viscoelasticity- heat generation- Strength- ozone attack,
effect of oxygen- Effect of temperature and frequency- Special environments- Solvents and
other media

UNIT III  DESIGN OF RUBBER COMPONENTS  9
Introduction – Viscoelasticity and its implication – Creep and stress relaxation and inter
relationship, Payne and Mullins - Shear and compression bearings – Planar sandwich forms
– Laminate bearings – Shape factors – Vibration and noise control - Design requirements –
Design of seals and O-rings – V-belts.

UNIT IV  INDIVIDUAL RUBBER FORMULATIONS  9
Formulating for natural and synthetic rubbers and typical recipes for a few rubber products,
Implications of FDA Regulations - Toxicity and environmental issues.

UNIT V  FORMULATION FOR PERFORMANCE REQUIREMENTS  9
Compounding to meet different Hardness requirements – low compression set – For
damping application – Compounding to meet bonding requirements with metals and textiles–
Compounding to meet processing – Economics of compounding – Cost estimation.

TOTAL : 45 PERIODS

REFERENCES
3. Theory and Practice of Engineering with Rubber by Freakley and Payne, Dynamic
1993.
7. Rubber Springs Design, Gobel E F., Translated and ed by Brichta A M., Newnes-
Butterworths, 1974.
OBJECTIVES

• To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills

• To help them improve their soft skills, including report writing, necessary for the workplace situations


2. Creating effective PPTs – presenting the visuals effectively

3. Using body language with awareness – gestures, facial expressions, etc.

4. Preparing job applications - writing covering letter and résumé

5. Applying for jobs online - email etiquette

6. Participating in group discussions – understanding group dynamics - brainstorming the topic

7. Training in soft skills - persuasive skills – sociability skills - questioning and clarifying skills – mock GD

8. Writing reports – collecting, analyzing and interpreting data – drafting the report

9. Attending job interviews – answering questions confidently

10. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

Requirements for a class of 30 students

1. A PC or a lap top with one or two speakers

2. A Collar mike and a speaker

3. An LCD projector and a screen

4. CD's and DVD’s on relevant topics

5. Individual chairs for conducting group discussions

REFERENCE BOOKS


EXTENSIVE READERS

WEB RESOURCES
1. www.humanresources.about.com
2. www.careerride.com

RP8611 COMPUTER AIDED MOULD DESIGN LABORATORY 0 0 4 2

LIST OF EXPERIMENTS
I DESIGN AND DRAWING OF MOULDS
1. Hand Mould
2. Semi – Injection Mould
3. Automatic Mould – with working area calculations
4. Multi Cavity – Multiday Light Mould
5. Split Cavity – Finger Cam Mechanism
6. Split Cavity – Dog Leg Cam Mechanism
7. Split Cavity – Cam tract Actuation
8. Side Core – Hydraulic Actuation
9. Collapsible core – Mechanism
10. Gear Core – Mechanism
11. Compression Mould
12. Transfer Mould

1. DESIGN AND DRAWING OF DIES FOR
1) Hot and Cold Extrusions
2) Extrusion of Tubes and profiles
II. ANALYSIS OF INJECTION MOULDING OF SIMPLE PRODUCTS USING MOULD ANALYSIS SOFTWARES


TOTAL : 60 PERIODS

RP8612 PLASTICS PROCESSING AND TESTING LABORATORY

L T P C

0 0 4 2

PLASTICS PROCESSING

1. Compounding and Mixing of plastic and their characteristics.
2. Semi and Fully Automatic Injection Molding-Piston Type.
3. Injection moulding
4. Extrusion of plastics-Single screw and Twin screw extruder
5. Compression moulding
6. Composites-Hand lay-up technique.
7. Study of Injection and Compression molds.
8. Study of machining of plastics
9. Study of Adhesive materials

PLASTICS TESTING

1. Tensile Testing of Plastics
2. Flexural Testing of Plastics
3. Compressive Testing of Plastics
4. Impact Testing of Plastics
5. Falling Dart Impact testing for films
6. Arc Testing of Plastics
7. Melt flow index

TOTAL : 60 PERIODS
UNIT I  INTRODUCTION TO COMPOSITES  9

UNIT II  MATERIALS USED IN POLYMER COMPOSITES  9
Thermoplastics and Thermosetting Matrix; Reinforcements-fibers- Classification, properties and applications, fiber orientation, fiber surface treatments, fillers and other additives used for composites processing, curing of the resins.

UNIT III  PROCESSING METHODS FOR FRP’S  9
Open and closed mould process-Hand lay up – Spray up – Vacuum and pressure bag moulding, resin injection moulding, vacuum impregnation and injection; bulk molding compounds – SMC, DMC,BMC compression, transfer and injection moulding, filament winding, pultrusion; centrifugal casting; common faults and troubleshooting.

UNIT IV  TESTING AND CHARACTERISATION OF COMPOSITES  9
General test methods for tensile, flexural, inter laminar shear strength, compression tests , impact strength tests; elevated temperature tests; void content, resin content, fiber content, gel time.

UNIT V  FINISHING AND APPLICATIONS OF COMPOSITES  9
Adhesive and mechanical joining, finishing; repairing- Surface damage, small impact failures, holes; Application of composites in aerospace, automotive industry, marine industry, civil engineering applications, electrical industry etc.

REFERENCES

**RP8702**  
**TYRE TECHNOLOGY**  
**L T P C**  
**3 0 0 3**  

**UNIT I  INTRODUCTION**  
Functions of tyres– Role of Rubber and unique properties of rubbers for the applications. tyre constructions – Generic design features and materials. Tubeless tyres – Comparison. Role of carcass in tyre behaviour and materials. Carcass design variables and construction principles.

**UNIT II  TYRE CORD AND CORD REINFORCED RUBBER**  

**UNIT III  STRUCTURE OF THE PNEUMATIC TYRE**  

**UNIT IV  TYRE STRESS, DEFORMATION, TYRE TRACTION AND WEAR**  

**UNIT V  MEASUREMENT AND ANALYSIS OF TYRE PROPERTIES**  

**TOTAL : 45 PERIODS**
REFERENCES

RP8711 COMPREHENSION L T P C 0 0 3 2

In the VII Semester a comprehension test will be conducted with at least one written test in the middle of the Semester with Objective type of questions and a terminal viva-voce test in order to evaluate the comprehension of the students in all the subjects covered in the all previous semester.

TOTAL: 45 PERIODS

RP8713 INDUSTRIAL TRAINING (6WEEKS) L T P C 0 0 4 2

All the students have to undergo practical industrial training of six week duration in recognized establishments. At the end of which they have to submit a report. The internal assessment will be based on the report and presentation and the examination marks be based on viva voce examination.

TOTAL: 60 PERIODS

RP8712 DESIGN PROJECT L T P C 0 0 4 2

The students are expected to carryout one design project in the following fields of Rubber/Plastics Technology:

1. Computer aided Drafting and Design
2. Product Development and Analysis
3. Development of Machines for Rubber Processing
5. Mould / Die Design
6. Process Control / Modification
7. Plant Layout

TOTAL: 60 PERIODS

RP8811 PROJECT WORK

Each student will be assigned a project involving some design and fabrication work as well as theoretical and experimental studies on some problem related to Rubber and Plastics Technology. Continuous internal assessment marks for the project will be given during project review meeting. The student has to prepare and present a detailed project report at the end of the semester and give a talk about the work done. End semester examination mark will be based on viva voce examination.

TOTAL: 180 PERIODS

GE8071 FUNDAMENTALS OF NANOSCIENCE

UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography
UNIT IV  PREPARATION ENVIRONMENTS 10
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V  CHARECTERISATION TECHNIQUES 10
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
1. G Timp (Editor), Nanotechnology, AIP press/Springer, 1999

RP8001  ADHESIVES AND SURFACE COATINGS  L T P C
3 0 0 3

UNIT I  FUNDAMENTALS OF ADHESION 8

UNIT II  NON REACTIVE ADHESIVES 10
UNIT III REACTIVE ADHESIVES
Phenolics, epoxies, acrylics, anaerobics, cyanoacrylates – Uses of adhesives in civil engineering, automobile, aerospace, electrical & electronic industries.

UNIT IV SURFACE COATINGS
Components of Paints – Preparations formulations, pigment dispersion, drying & film formation mechanisms, types of paints – based on emulsion, oil, alkyds, epoxies, PF, UF etc, Urethanes, Silicones – Primers like chlorinated rubber – applications, powder coatings.

UNIT V SURFACE PREPARATION AND TESTING
Surface preparation for adhesion & painting, powder coatings, factors affecting coating properties, barrier properties – Rheology & its importance, paint & adhesion performance testing.

TOTAL : 45 PERIODS

REFERENCES

RP8002 ADVANCED POLYMER PROCESSING L T P C
3 0 0 3

UNIT I ADVANCED INJECTION MOULDING PROCESS - I

UNIT II ADVANCED INJECTION MOULDING PROCESS – II
Multi-layer Moulding, Counter flow moulding, Liquid Injection Moulding processes. Structural foam moulding - Low pressure and high pressure processes - Merits & demerits.

UNIT III ADVANCED EXTRUSION PROCESSES
Introduction - Profile Extrusion - Material - Process - Process optimisation - Cooling Profile

UNIT IV  ADVANCED BLOW MOULDING - I  9

UNIT V  ADVANCED BLOW MOULDING – II  9

TOTAL : 45 PERIODS

REFERENCES


RP8003  BIOPOLYMERS AND POLYMERS FROM RENEWABLE RESOURCES  L T P C
3 0 0 3

UNIT I  POLYMERS & SUSTAINABILITY  9

UNIT II  RESOURCES FOR BIOPOLYMERS  9
Polysaccharide based polymers – Gelatinization – Starch based blends - Biodegradation of Starch based Polymers - Production of Lactic acid and Polylactide - Properties and applications of Polylactides – Introduction to Polyhydroxyalkanoates and their derivatives – Applications – Chitin & Chitosan and its derivatives as biopolymers
UNIT III  PROTEINS, HEMICELLULOSE AND CELLULOSE BASED BIOPOLYMERS  9
Plant and animal based Proteins – Solution casting of proteins – Processing of proteins as plastics – preparation and properties of hemicellulose – Cellulose based Composites – Surface and Chemical modifications of Cellulose fibers

UNIT IV  PACKAGING APPLICATIONS OF BIOPOLYMERS  9

UNIT V  BIOPOLYMER APPLICATIONS FOR AGRICULTURE  9
Biopolymer Films – Biodegradable mulching – Advantages and Disadvantages - Chemical sensors – Biosensors - Functionalized Biopolymer Coatings and Films – Applications of biopolymers in horticulture

TOTAL : 45 PERIODS

REFERENCES
1. Biopolymers – New Materials for Sustainable films and Coatings, David Plackett, John Wiley & Sons Ltd, 2011
2. Biopolymers from Renewable resources, David Kaplan, springer, 1998
of single sampling plan – Standard sampling plans for AQL and LTPD – Use of standard sampling plans – Sequential sampling plan.

UNIT III  EXPERIMENTAL DESIGN AND TAGUCHI METHOD  9

UNIT IV  RELIABILITY AND ITS PREDICTION  9

UNIT V  FAILURE DATA ANALYSIS  9
Real time distribution, exponential, normal, log normal, gamma and weibull – Reliability data requirements – Graphical evaluation.

TOTAL : 45 PERIODS

REFERENCES
1. Amita Mitra “Fundamentals of Quality Control and Improvement” Pearson Education 2002

RP8005  FRACTURE BEHAVIOUR IN POLYMERS  L T P C
3 0 0 3

UNIT I  FATIGUE OF STRUCTURES  7

UNIT II  STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR  10
Low cycle and high cycle fatigue - Coffin - Manson’s relation - Transition life - cyclic strain
hardening and softening - Analysis of load histories - Cycle counting techniques - Cumulative damage - Miner’s theory - Other theories.

UNIT III  PHYSICAL ASPECTS OF FATIGUE 10
Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations - fatigue fracture surfaces.

UNIT IV  FRACTURE MECHANICS 10
Strength of cracked bodies - Potential energy and surface energy - Griffith’s theory - Irwin - Orwin extension of Griffith’s theory to ductile materials - Stress analysis of cracked bodies - Effect of thickness on fracture toughness - Stress intensity factors for typical geometries.

UNIT V  FATIGUE DESIGN AND TESTING 8
Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

TOTAL : 45 PERIODS

REFERENCES

RP8006  LATEX SCIENCE AND TECHNOLOGY  L T P C
3 0 0 3

UNIT I  LATEX CHARACTERISTICS AND CONCENTRATION METHODS 9
Definition of Latex, classification, Latex particle size and distribution, stability and destabilization of latices, Comparison between latices and polymer solution;

Natural rubber latex –origin, tapping, bulking and preservation, composition of field latex, properties, preservation, methods of concentrating latex - creaming, centrifuging, &
evaporation,– Specification and testing- (National and ISO) for latex grades (ASTM D 1076 )

UNIT II  LATEX COMPOUNDING
Latex compounding-Ingredients, Preparation of Dispersions, Emulsion, Slurries; Machineries-Ball mill, Pearl mill; Preparation of latex compound and maturation; Prevulcanized latex, MG Latex, -Preparation, properties and application; Evaluation of the latex compound- Chloroform number, swelling index test; Design for latex products formulation.

UNIT III  LATEX DIPPING PROCESS
Principle and types of dipping process, Dipping plant design, formers, sequence of operation, post processing; Manufacture of Condoms, Gloves, Catheters, Balloons- formulations, process, specification, testing and troubleshooting.

UNIT IV  LATEX FOAM, SHEETING AND SPRAYING
Principle and Manufacture of Foam-Dunlop and Talalay process, Compound design-Process details, Foam properties, testing and defects, foam applications;

Latex sheeting; latex binders and carpet backing- Basics and process.

UNIT V  EXTRUSION AND PRODUCTS BASED ON SYNTHETIC LATEX
Principle and Manufacture of latex elastic threads; latex tubing; latex casting process specification and testing, defects.

Synthetic latex- Types, properties, and application- surface coatings, adhesives, paper industries.

TOTAL: 45 PERIODS

REFERENCES
1. Blackley, D.C., High Polymer Latices, Vol 1 and 2, Maclaren & Sons
UNIT I  THERMODYNAMICS

UNIT II  MELT PROCESSING OF POLYMER BLENDS
Factors influencing Morphology – Influence of Processing methods on Morphology Chemistry of compatibilization – Compatibilizers - Reactive compatibilization – Commercially important Blends: Structure – Property relationships

UNIT III  MORPHOLOGY& MICROSTRUCTURE
Continuous & discontinuous phases – Microscopic Phase visualization methods – Optical Microscopy, TEM, SEM and AFM – Dispersed phase size and Dispersion Uniformity – Glass transition in Polymers blends and copolymers – Applications of thermal analysis in crystalline polymer blends – Interpenetrating Polymer networks

UNIT IV  PROPERTIES OF POLYMER BLENDS
Thermo-mechanical Performance of amorphous – Amorphous and Amorphous- Crystalline blends – Permeability of miscible blends – Barrier materials through control of Blend morphology – Reinforced polymer blends

UNIT V  ELASTOMER BLENDS

TOTAL : 45 PERIODS

REFERENCES

RP8009 PLASTICS PRODUCT AND MOULD DESIGN

UNIT I CONCEPT OF PLASTIC PRODUCT DESIGN

UNIT II DESIGNING STRUCTURAL PRODUCTS

UNIT III COMPOSITES AND TOOLING DESIGN

UNIT IV DESIGN OF INJECTION MOLDS
Principles of mould design-Standard mould system -Determination of mould size-design for core, cavity, runner, gates, guide pillar, venting, Ejection-simple mould design-Simple case study.

UNIT V EXTRUSION DIES AND MAINTENANCE OF MOLDS

TOTAL: 45 PERIODS
REFERENCES

RP8010 POLYMER RECYCLING L T P C 3 0 0 3

UNIT I FUNDAMENTALS OF PLASTICS RECYCLING 6

UNIT II RECYCLING OPERATIONS 8

UNIT III RECYCLING MATERIALS- I 12

Nylon recycling – Chemical recycling – Mechanical recycling – applications Depolymerization of PMMA.

UNIT IV RECYCLING MATERIALS- II


UNIT V RUBBER RECYCLING


TOTAL: 45 PERIODS

REFERENCES

UNIT I  INTRODUCTION TO PACKAGING  
Definition, functions of packaging, types and selection of package, packaging hazards, interaction of package and contents, materials and machine interface, environmental and recycling considerations-Life cycle assessment; Package design-Fundamentals, factors influencing design, stages in package development.

UNIT II  DIFFUSION AND PERMEABILITY  
Diffusion-Types of diffusion, Fick's law of diffusion and applications; Diffusion coefficients of gas, liquid and vapour in polymers and packaging films, techniques to measure diffusion coefficient in polymer interface; Polymer permeability, gaseous transport in polymers, permeability measurement.

UNIT III  POLYMERS & MANUFACTURING OF PACKAGING MATERIALS  
PE,PP,EVA,EVOH,PVC,PVDC,PS,ABS,EPS,Polyester,Polyamide,PC,PPE,,Cellulosics,PEEK,TPE and PEN,PEI and LCP ;Biodegradable polymers- PLA,PGA,PCL,PHA and PHB and Foam based on PE,PP & PU -Properties and applications.

Flexible and Rigid Packaging-Extrusion- Blown film, cast film, multi-layer film and sheet, lamination; Injection moulding; Blow mouldin ;Thermoforming; Surface treatment for printing and printing processes.

UNIT IV  SPECIALITY PACKAGING  
Aerosol packaging, shrink and stretch wrapping, blister packaging, antistatic packaging, aseptic packaging, active packaging, modified atmospheric packaging, ovenable package, cosmetic package, hardware packaging, food packaging, textile packaging, health care packaging, export packaging.

UNIT V  TESTING OF PACKAGING MATERIALS  
Package Testing- Mechanical properties – Tensile and tear properties, Impact properties, Burst strength, Stiffness, Crease or flex resistance; Co-efficient of friction, Blocking Orientation and Shrinkage; Optical Properties – Clarity, Haze and gloss; Barrier Properties – Oxygen transmission, Water vapour transmission rate migration; Chemical resistance tests

TOTAL: 45 PERIODS
REFERENCES

RP8012 POLYURETHANE SCIENCE AND TECHNOLOGY L T P C
3 0 0 3

UNIT I PRINCIPLES OF PU CHEMISTRY AND SPECIAL APPLICATIONS 12
Reactions of isocyanate group-building blocks for PUs-polyols, isocyanates, chain extenders – Preparation methods like prepolymer process, one shot process-preparation of aqueous two phase systems – Special areas like ionomers,LCP based on PUs, hydrogels, promoters-Uses in medical areas, bio technology, optical lenses etc Structure-property relationships in hard and soft segments - Morphology of domains-Effect of cross links on PU properties, structure-property relationships in ionomers

UNIT II RAW MATERIALS AND AN OVERVIEW OF PROCESSING OF PU 6
Polyols, isocyanates – Their preparation and characteristics, conversion products of the raw materials – Additives – Industrial hygiene –Principles of PU processing

UNIT III PU FOAMS 9
Flexible foams-Their production-Equipment and process, properties and uses
Rigid foams-Production and properties-Relationship between production methods and properties, uses – Integral skin foams- RIM

UNIT IV SOLID PU MATERIALS 9
Casting of PUs, TPEs-Production, processing and uses, millable PUs-preparation, properties and uses

UNIT V PU COATINGS AND ADHESIVES 9
Solvent based coatings, air dried coatings, solvent free paints and coatings, applications of PU based coatings two components and one component adhesives based on PUs, solvent based adhesives, dispersion adhesives, hot melts, PU binders.

TOTAL: 45 PERIODS
REFERENCES

RP8013 PRODUCT DESIGN AND COST ESTIMATION

UNIT I INTRODUCTION
The design process – Selection of the right product – Market survey and research – factors to be studied preparatory to design – market development – product life cycle.

UNIT II CRITERIA FOR PRODUCT SUCCESS
Functional design – aesthetic design – Incorporating – quality, durability and reliability into design – design for case of manufacture and maintenance – design optimization.

UNIT III PROCESS PLANNING

UNIT IV ESTIMATING, COSTING AND ELEMENTS OF COST

UNIT V ANALYSIS OF OVERHEAD EXPENSES:

TOTAL : 45 PERIODS
# REFERENCES


<table>
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## UNIT I INTRODUCTION
Identification of plastics / rubber components in automobiles – Function – Selection criteria.

## UNIT II STRUCTURE-PROPERTY RELATIONSHIPS IN RUBBERS
Resilience, creep, hysteresis and damping, stability, set and stress relaxation, behaviour in dynamic applications.

## UNIT III VIBRATION AND RUBBER SPRING

## UNIT IV FLUID SEALINGS AND FLEXIBLE COUPLINGS AND HOSES

## UNIT V COMPOUNDING AND MANUFACTURE

**TOTAL : 45 PERIODS**

## REFERENCES

4. The scope of the subject will include studies on the following components: Cylinder head gasket: ACM, Silicon
5. Oil Pan gasket : ACM
7. Vacuum Hose : CR, CM, AEM
8. Oil Circuit and blow-by seals : AEM, FPM, HNBR
9. Oil hose : AEM
10. Oil filter base gasket : NBR, AEM and ACM
11. Dipstick guide : HNBR
12. Dipstick seal : NBR, FPM
13. Drain plug seal : NBR, ACM
14. Air filter intake duct : TPV-(EPDM+PP)
15. Throttle valve intake duct : TPV-(EPDM+PP), EPDM, NBR/PVC, CM, ECO
16. Throttle valve seals : NBR
17. Air intake manifold seals : NBR
18. Cooling Hose : EPDM
19. Cooling Seals : EPDM

MG8651 ENGINEERING MANAGEMENT L T P C 3 0 0 3

UNIT I PRINCIPLES OF MANAGEMENT & PERSONNEL MANAGEMENT 7

UNIT II INVENTORY MANAGEMENT 11
Purpose of Inventory – Cost Related to inventory – Basic EOQ Model – Variations in EOQ Model – Finite Production – Quality Discounts – ABC Analysis – MRP

UNIT III OPERATIONS MANAGEMENT 10
UNIT IV  FINANCIAL MANAGEMENT

UNIT V  MARKETING MANAGEMENT

TOTAL : 45 PERIODS

REFERENCES

MG8654 TOTAL QUALITY MANAGEMENT

AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I  INTRODUCTION
UNIT II  TQM PRINCIPLES  
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III  TQM TOOLS & TECHNIQUES I  

UNIT IV  TQM TOOLS & TECHNIQUES II  

UNIT V  QUALITY SYSTEMS 

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCE BOOKS
UNIT I   EXTENSOMETERS AND DISPLACEMENT SENSORS  8
Principles of measurements, Accuracy, Sensitivity and range of measurements, Mechanical, Optical, Acoustical and Electrical extensometers and their uses, Advantages and disadvantages, Capacitance gauges, Laser displacement sensors.

UNIT II  ELECTRICAL RESISTANCE STRAIN GAUGES  12
Principle of operation and requirements, Types and their uses, Materials for strain gauges, Calibration and temperature compensation, cross sensitivity, Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators, Rosette analysis, stress gauges, load cells, Data acquisition, six component balance.

UNIT III  PHOTO ELASTICITY  11
Two dimensional photo elasticity, Photo elastic materials, Concept of light - photoelastic effects, stress optic law, Transmission photo elasticity, Jones calculus, plane and circular polariscopes, Interpretation of fringe pattern, Calibration of photoelastic materials, Compensation and separation techniques, Introduction to three dimensional photo elasticity.

UNIT IV  BRITTLE COATING AND MOIRE TECHNIQUES  7
Relation between stresses in coating and specimen, use of failure theories in brittle coating, Moire method of strain analysis.

UNIT V  NON – DESTRUCTIVE TESTING  7
Fundamentals of NDT, Acoustic Emission Technique, Radiography, Thermography, Ultrasonic, Eddy Current testing, Fluorescent Penetrant Testing,

TOTAL : 45 PERIODS

REFERENCES

AU8071  FINITE ELEMENT TECHNIQUES  L T P C
3 0 0 3

UNIT I  INTRODUCTION 8

UNIT II  STATIC ANALYSIS 10

UNIT III  DYNAMICS ANALYSIS 8

UNIT IV  HEAT TRANSFER AND FLUID FLOW ANALYSIS 10

UNIT V  AUTOMOTIVE APPLICATION 9
Force distribution on different parts of automotive structure, design of the parts, static, dynamic and thermal analysis of the parts using finite element method. Material redistribution to minimize stresses and deflection. Optimization of location of ribs to maximize rigidity.

TOTAL : 45 PERIODS
TEXT BOOK

REFERENCE

ME8076 ENTREPRENEURSHIP DEVELOPMENT L T P C 3 0 0 3

OBJECTIVE
Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS

UNIT IV  FINANCING AND ACCOUNTING  9

UNIT V  SUPPORT TO ENTREPRENEURS  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

PR8451  MACHINE COMPONENTS DESIGN  L T P C  3 0 0 3

OBJECTIVE
• To introduce the students the design and theory of common machine elements and to give experience in solving design problems.
UNIT I  INTRODUCTION  

UNIT II  DETACHABLE AND PERMANENT JOINTS  
Design of Bolts Under Static Load, Design of Bolt with Tightening/Initial Stress, Design of Bolts subjected to Fatigue – Keys -Types, Selection of Square and Flat Keys-Design of Riveted Joints and Welded Joints.

UNIT III  SHAFTS, COUPLING AND BRAKES  
Design of Shaft –For Static and Varying Loads, For Strength and Rigidity-Design of Coupling-Types-Flange, Muff and Flexible Rubber Bushed Coupling-Design of Brakes-Block and Band Brakes.

UNIT IV  GEAR AND BELT DRIVES  
Design of Spur, Helical, Bevel and Worm Gear drives-Design of Belt drives-Flat and V Belts.

UNIT V  SPRINGS AND BEARINGS  

TEXT BOOK

REFERENCES