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*Four weeks of training during 6th semester Vacation*

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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.

OUTCOMES:

• Understanding the techniques to develop reading comprehension skills which will help the learners in acquiring knowledge from various reading materials.
• Effectively exploiting Scientific and Technical writing which has a world-wide demand in the corporate and industrial sectors.
• Intensified awareness about the language styles used in the field of Media and Mass communication.
• Improved reading strategies adaptation while reading science and technical texts.
• Ability to speak effectively in English in real life contexts and work-related ambiance.

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
OBJECTIVES

• To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
• 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.
• To familiarize the student with functions of several variables. This is needed in many branches of engineering.
• To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

OUTCOMES:

• Develops the use of matrix algebra techniques which is needed by engineers for practical applications.
• Able to use the infinite series approximations for solutions arising in mathematical modeling.
• Familiarize the student with functions of several variables which is needed in many branches of engineering.
• Introduces the concepts of improper integrals, Special functions which are needed in engineering applications.
• Acquaints the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES

UNIT II  INFINITE SERIES  

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  

UNIT IV  IMPROPER INTEGRALS  

UNIT V  MULTIPLE INTEGRALS  

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

PH 8151

ENGINEERING PHYSICS

(Common to all branches of B.E / B.Tech programmes)

OBJECTIVE:

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

OUTCOMES:

• Gain the basic knowledge about the elastic nature of materials and fundamentals of structural stability.

• Students will be familiarize with the fundamentals of acoustics and ultrasonics, which provides the basics for the development of acoustics and ultrasonic engineering.

• Good understanding of thermal physics and thermodynamics is achieved for further applications in automobile, structural and electronic industries.

• Acquire knowledge about laser and its applications in communication and information processing and also scientific applications.

• Fundamentals of structural and related properties of solids provide knowledge on the applications of materials in engineering and technology.

UNIT I PROPERTIES OF MATTER


UNIT II ACOUSTICS AND ULTRASONICS

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and

UNIT III THERMAL PHYSICS  9

UNIT IV APPLIED OPTICS  9

UNIT V SOLID STATE PHYSICS  9
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

OBJECTIVES:

To make the student conversant with the
  • Applications of second law of chemical thermodynamics.
  • Phase rule and various types of alloys
  • Surface chemistry and its importance in adsorption and catalysis.
  • Basic principles in organic reaction mechanisms and principles and applications of spectroscopy
  • Nanochemistry and its applications

OUTCOMES:

• The key features of thermodynamics enable the students for gaining the knowledge of various thermodynamic properties which affect the feasibility of the reaction.

• Students will be with brief concepts of polymer chemistry provides them the technical applications of polymer in various fields.

• Enable the students to gain knowledge about various factors responsible for velocity of reaction.

• The fundamentals of photochemistry & spectroscopy help them to understand the various changes in atoms/ molecules during the reaction.

• Understand the dimension of nanoparticles and its real time applications.

UNIT I CHEMICAL THERMODYNAMICS 9
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 9
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 9

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

UNIT V NANOCHEMISTRY 9

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES

GE8151 COMPUTING TECHNIQUES L T P C 3 0 0 3

OBJECTIVE
• To impart the basic knowledge of computing and C programming.

OUTCOMES
• To demonstrate of knowledge in fundamentals of computing systems.
• Understand the fundamentals of programming C language.

UNIT I INTRODUCTION 8

UNIT II C PROGRAMMING BASICS 10
Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals

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
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.

OUTCOMES:
• Understand various projection methods in plotting the 2D and 3D drawing.
• Acquire the drafting practice of orthographic projections.
• Gain the drafting knowledge of projecting a solid object.
• Understand the various solids and their developments.
• Develop the drafting practice of isometric and prospective views of various solids.

CONCEPTS AND CONVENTIONS (Not for Examination)
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.
OBJECTIVE
To make the students understand and get hands-on in the basic concepts of practical Physics.

OUTCOMES:
• Capable to implement various laboratory exercises in Torsional Pendulum, Non-uniform bending, Lees’ disc, Potentiometer, Air wedge, Optical fiber
• Able to solve problems related to engineering physics.

EXPERIMENTS
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 co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL : 30 PERIODS
OBJECTIVE
To provide hands-on experience in using PH meter, potentiometry, titration methods and estimating the strength of given solutions.

OUTCOMES:
• Ability to solve various problems related to Weighing and preparation, Water Analysis, PH-Meter, Conductometry, Viscometry, Water Pollution.
• Able to solve problems related to engineering chemistry.

EXPERIMENTS
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 Iodometry.
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.

REFERENCES

GE8161  
COMPUTER PRACTICES LABORATORY  

OBJECTIVE  
To make the students understand and get hands-on in the basic concepts of practical Physics.

OUTCOMES  
• Capability to apply the knowledge on computer applications related to office automation.
• To implement programs in C.

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.

OUTCOMES
• Depict the hands-on experience in plumbing and various joints in plumbing.
• Gain knowledge in basic household wiring system in electrical engineering practice.
•Expose the students to practice basic welded joints and basic machining operations.
• Understand the principle of soldering in a electronic circuit, PCB and various basic electronic items.

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

OUTCOMES

- Proficiency in personality development skills and professional skills in getting placed in multi-national companies.
- Dexterous in problem solving skills, thinking skills, and analytical skills to cope themselves in the working environment.
- Ability to build up job application letters and CV-résumés.
- To become eminent in developing interpersonal skills to maintain rapport with their counterparts and higher officials.
- Become proficient in oral and written communication, critical thinking skills, active listening skills and can participate successfully in group discussions

UNIT I 9 + 3
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 9 + 3
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  
9 + 3
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
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 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.

OUTCOMES

• Students acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
• Acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
• Gain knowledge in applications of complex variable in heat conduction, elasticity, fluid dynamics and flow of electric current.
• Enable the student to use different techniques in solving complex integration.
• Able to use 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

OBJECTIVES
• To introduce different types of materials preparation and processing.
• To understand the importance and applications of different materials.

OUTCOMES
Students will able to:
• Acquire the knowledge of materials preparation and processing using phase diagram and various techniques.
• Familiarize with conducting materials based on different functions and properties of superconductors.
• Gain the knowledge on semiconducting materials based on energy level diagram and its types.
• Realize with theories of magnetic materials and understand the dielectric behavior on insulating materials.
• Familiarize with FRP, Ceramic Fibres and Fibre reinforced metals and its characterization techniques.

UNIT I MATERIALS PREPARATION AND PROCESSING 9
UNIT II CONDUCTING MATERIALS

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

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  L T P C 3 0 0 3

OBJECTIVE
• To make the student familiarize with chemical kinetics, catalysis, electrochemistry, corrosion and preparation of monomers.

OUTCOMES
• Appreciate the importance of physical chemistry in industrial scenario with respect to chemical kinetics and catalysis.
• Get familiar with the concept of electrochemistry and corrosion.
• Explain the relationship between chemical structure and reactivity and reaction intermediates.
• Utilize the different reaction mechanism which will be useful in polymer preparation.
• Familiar with synthesis and properties of monomers relevant to polymer technology.

UNIT I  CHEMICAL KINETICS AND CATALYSIS  9
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  9

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, carbo...
cations, carbanions, elementary ideas about stereo chemistry.

UNIT IV DETAILS OF REACTION MECHANISMS
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
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

OBJECTIVE
• To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

OUTCOMES
• Students will be able to get familiar with various laws of mechanisms and equilibrium conditions.
• Gain knowledge on force and supports developed in 2D surface and 3D objects.
• Able to calculate the centroid and centre of gravity position of various surface and solids.
• To resolve the forces in a particle in dynamic state.
• Understand friction and various elements of rigid body dynamics.
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

OBJECTIVES
• 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.

OUTCOMES
• Acquire the knowledge on broad classification of machining processes.
• Able to understand the principle operations in ultrasonic, abrasive and water jet machining.

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• Acquaintance of the principle, process, parameters and various operations in EDM and WEDM.
• Comprehend the principle, process parameters in CHM and ECM.
• Gain the knowledge on principle, operations performed in EBM, LBM and PAM.

UNIT I LATHE


UNIT II SHAPER, PLANER & SLOTTER


UNIT III DRILLING


UNIT IV MILLING


UNIT V GRINDING


TOTAL: 45 PERIODS

TEXT BOOK


REFERENCES


OBJECTIVE

- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.
OUTCOMES:
• Able to solve problems related to engineering chemistry
• Familiarization with equipment like viscometers, flash point apparatus etc
• Familiarization of methods for determining COD, chlorine content, acidity etc
• Familiarisation of a few simple synthetic techniques for soap, dyes, defoamers etc

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

GE8211 COMPUTER PROGRAMMING LABORATORY

OBJECTIVES:
The Students should be made to
• Be exposed to Unix shell commands
• Be familiar with an editor on Unix
• Learn to program in Shell script
• Learn to write C programme for Unix platform

OUTCOMES:
At the end of the course the students should be able to:
• Use Shell commands
• Design of Implement Unix shell scripts
• Write and execute C programs on Unix
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
LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Terminals with C and C++ Compiler

TOTAL : 45 PERIODS

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.

OUTCOMES
• To make students acquire a sound knowledge in statistical techniques
• To make students acquire fundamental knowledge about probability concepts
• To make students understand concepts like random variables
• To make students understand concepts like design of experiments
• To make students understand concepts like SQC

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

AE8351 SOLID MECHANICS L T P C 3 0 0 3
OBJECTIVES:
• 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 course.
To provide knowledge on analysis of various structural elements for
different loading conditions.

OUTCOMES
• Able to determine stresses and strains due to axial loading.
• Illustrate SF & BM diagrams of various beams and to calculate bending stress in various beams.
• Analyse various methods of deriving beam deflection and strain energy.
• Acquaintance of torsional effect on shafts, spring and the concept of struts and column.
• Understanding the concepts of principle stress and Mohr’s circle stresses in thin cylinders.

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.
TEXTBOOKS

REFERENCES

EE8252 PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVE
• To introduce the fundamental concept of electrical and electronics engineering such as electronic components, circuits, logic gates and digital circuits etc.

OUTCOMES
• Familiarize with different electronic components and its devices.
• Acquaint the knowledge of various circuits and amplifiers.
• Understand the concepts of logic gates and digital circuits.
• Impart knowledge in measurements and instruments.
• Able to understand various parameters of microprocessors and its applications.

UNIT I ELECTRICAL CIRCUITS
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
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

UNIT IV ELECTRONIC DEVICES & CIRCUITS

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)

REFERENCES

TOTAL : 45 PERIODS
OBJECTIVES

• To highlight on basics of heat and mass transfer processes.
• To enlighten the students with fundamentals related to mixing, separation and drying processes.

OUTCOMES

• Students introduced to various types of unit operation in chemical industries.
• Exhibit an indulgent in the basics of heat and mass transfer mechanism and to demonstrate the ability to apply the principle of heat and mass transfer in rubber and plastics processing.
• Students will able to comprehend the agitation of liquids, absorption and adsorption and machinery used for the process.
• Students will acquire the knowledge on principles and process for drying and humidification.
• Students will recognizable with membrane separation process, size reduction and mechanical separation process.

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  
OBJECTIVES
• To make the students understand, analyze and apply the mechanisms of polymerization in various industrial polymerization techniques.
• To enlighten the students with the solution properties, molecular weight and molecular weight distribution of polymers.

OUTCOMES
• Students become recognizable with basic classification of polymers
• Analyze the mechanism of polymerization in the synthesis of various polymers and polymerization techniques.
• Demonstrate the ability to relate the structure–property relationship in arriving at a decided property
• Able to calculate the molecular weight of polymers
• Able to realize the various transition in polymers.

UNIT I  INTRODUCTION

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

RP8303 THERMODYNAMICS AND FLUID MECHANICS L T P C
3 1 0 4

OBJECTIVES
To make the students understand

- the basic thermodynamic concepts and various cycles and steam in a thermodynamic system.
- the basic fluid mechanic concepts
- the basic equations and fluid flow analysis
- the incompressible inviscid flow.

OUTCOMES
- Familiarize with energy transfer in thermodynamic systems and entropy changes.
- Will able to determine output and efficiency for different air standard cycles.
- Able to understand the forces due to fluids and to predict the prototype performance from the model.
- Acquire the knowledge about fundamental laws on fluid motion.
- Able to measure fluid flow properties and mathematical representation of the same.

UNIT I BASIC THERMODYNAMICS
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
OBJECTIVE
• To train the students in testing and quantifying the mechanical properties of Engineering Materials, Engines.

OUTCOME
• Students were trained in testing and quantifying the mechanical properties of Materials, Engines and Heat Exchanger.

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
OBJECTIVES:
To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response. To expose the students to the basic operation of electrical machines and help them to develop experimental skills.

OUTCOMES
• Able to do the test on AC and DC machines and electronic circuits.
• Able to handle CRO for various applications.
• Able to know the characteristics and applications of transducers.

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
• To impart knowledge on numerical methods that will come in handy to solve numerically the problems that arise in engineering and technology. This will also serve as a precursor for future research.

OUTCOMES
• Demonstrate various methods of solving system of equations.
• Acquire knowledge on fitting polynomials
• Examining the approximate solution for numerical integration and differentiation.
• Able to formulate and solve initial value and boundary value problems.

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  9+3
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

OBJECTIVE

• The student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

OUTCOMES

• Demonstrate the understanding about the constitutes of the environment, precious resources in the environment, conservation of resources.
• Gain the knowledge on causes, effects and control measures of environmental pollutions.
• Understand the role of a human being in maintaining a clean environment and useful environment for the future generations.
• Able to know the importance of ecological balance and preservation of bio-diversity.
• Understand the importance of sustainable development, social issues and different pollution control acts.
• Up to date knowledge on the human population growth and its related environmental issues.

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, mining, 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 SOCIALES ISSUES AND THE ENVIRONMENT 7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCE BOOKS

RP8401 PHYSICAL PROPERTIES OF POLYMERS

OBJECTIVE
• To impart fundamental knowledge on flow behaviour of polymers, structure property relationship of polymers.

OUTCOMES
• Realize the solution and the flow behavior of polymers.
• Comprehend the mechanical behavior of polymers and its test methods.
• Acquire the awareness of Frictional and wear properties of polymers.
• Obtain the facts of electrical properties of polymers and its applications.
• Learn the optical properties of polymers and ability to use them for design applications.

UNIT I STATES OF AGGREGATION IN POLYMERS
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
characteristics – Crazing in glassy polymers – Role of crazing in fracture – Macroscopical fracture theory – Fracture and microstructure

UNIT III   FRICTION AND WEAR IN POLYMERS

UNIT IV   ELECTRICAL PROPERTIES OF POLYMER

UNIT V   OPTICAL PROPERTIES OF POLYMERS

REFERENCES

OBJECTIVES
• To make them understand the structure property relationship of various plastics.
• To make them understand the importance of structure property relationship to choose the materials for various applications.
OUTCOMES
• Classify the different types of plastics
• Demonstrate an idea about structure property relation of different plastics and its uses.
• Be familiar with the preparation, properties and application of various commodity plastics.
• Acquire the knowledge of preparation, properties and application of thermosets and engineering plastics and speciality polymers.
• Ability to select the plastics for various end uses in industry.

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

TOTAL : 60 PERIODS
REFERENCES

OBJECTIVES
• To enable the students understand the importance of chemical structural features in determining the properties of the rubbers.
• To make the students aware of various rubbers – their preparations, properties and uses.
• To make the students understand the importance of compounding ingredients in a rubber and get detailed knowledge about the ingredients.

OUTCOMES
• Understand the concepts of flexible polymer chains and its influence in properties of rubber.
• Appreciate the influence of chemical structure in various properties of elastomer.
• Acquire basic knowledge on Natural Rubber, properties and its applications.
• Familiar with preparation, properties and application of various synthetic rubbers, TPEs.
• Familiarize about rubber additive.

UNIT I STRUCTURE-PROPERTY RELATIONSHIPS IN RUBBERS
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
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

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

UNIT V  FILLERS AND OTHER ADDITIVES
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
OBJECTIVES
To make the student to understand the
- Various mechanism and its kinematic analysis.
- Various frictional force in mechanical devices.
- Various profile of gear and its mechanisms.
- Balancing in mechanical systems and various vibrations

OUTCOMES
- Analyze the practice of forming different mechanism using link
- Be familiar with friction force and its importance in mechanical devices
- Understanding the analysis of gear and cam power transmission
- Scrutinize the effect of unbalance and balancing techniques
- Acquire the knowledge of different vibration and to analyze the transmission of vibration

UNIT I MECHANISMS

UNIT II FRICTION
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
UNIT IV  BALANCING

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


TOTAL : 60 PERIODS

REFERENCES

RP8411  COMPUTER AIDED PARTS & ASSEMBLY DRAWING

OBJECTIVE
• To make the students to understand the CAD concepts and assembly of various mechanical elements.

OUTCOMES
• Students will be trained in construction of machine elements and assembly drawing.
• Students will able to allocate geometrical tolerances and to develop part drawing.
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

REFERENCES

OBJECTIVES
- To provide hands on experience on various polymerization techniques.
- To make the student understand simple experimental procedures to determine
molecular weight and molecular weight distribution of polymers.
• To make the student familiarize with the thermal properties of polymers.
• To make the student understand simple techniques to identify the plastic materials.

OUTCOMES
• Capability to identify plastics materials.
• Able to synthesize various types of polymers.
• Able to measure viscosity of polymer solutions.

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

OBJECTIVES
• To emphasize the importance of additives for plastics.
• To make them understand the structure property relationship and applications of engineering plastics and high performance polymers.
• To highlight the applications of specialty polymers.

OUTCOMES
• Students understand the importance of additives in plastics.
• Students understand the uses of surface modifiers, stabilisers etc used in plastics.
• Students acquire fundamental knowledge about preparation and uses of engineering plastics like polyesters, LCP etc.
• Students acquire knowledge about high temperature plastics like fluoropolymers, polyimides, poly heterocyclics etc.
• To introduce specialty polymers like those with piezoelectric, ferroelectrics, biomedical polymers etc.

UNIT I ADDITIVES FOR PLASTICS-I

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

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

UNIT IV HIGH TEMPERATURE PLASTICS
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
Polymers for electronic applications, conducting polymers – Photoresists, polymers in optoelectronics polymers with piezoelectric, pyroelectric & ferroelectric properties – Polymers in bio medical applications.

REFERENCES
OBJECTIVE
• To study the flow behaviour of plastics and its processing techniques.

OUTCOMES
• Familiarize with various types of additives used for plastics and its mixing machinery.
• Acquaint of various parameters to operate injection molding machine.
• Realize the application of different types of injection molds.
• Gain knowledge of principle and process of extrusion, calendaring and blow molding operations.
• Aware of thermoforming, rotational molding and finishing, machining and welding of plastics.

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

UNIT II EXTRUSION PROCESS & BLOW MOULDING
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 Blow molding-Extrusion blow molding – Injection Blow moulding – Stretch Blow moulding – Co extrusion Blow moulding – Wall thickness and parison thickness relationship.

UNIT III INJECTION MOULDING OF PLASTICS-I


UNIT IV INJECTION MOULDING OF PLASTICS-II
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


REFERENCES

5. The role of additives in plastics – L. MASCIA, Edward Arnold publication.

RP8503  RUBBER AND PLASTICS TESTING  L T P C
        4 0 0 4

OBJECTIVES

To make the student familiarize with
- Various standards, specifications and principles of rubber and plastics testing.
- Various mechanical testing of polymers.
- Thermal, optical and electrical studies of rubber and plastics.
- Various durability studies in elastomers.

OUTCOMES

- Understand the importance of standards and specifications.
- Familiarization about various test methods on Rubber and Plastics used in industry.
- Access and analyze the properties and performance of the rubber and plastic products in service condition.
- Understand the techniques and instruments used to measure vulcanization of rubbers.
- Carry out the destructive and durability tests of elastomers.
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
OBJECTIVES
To study the mixing mechanism of rubber, machinery and process.
- To study the manufacture of different rubber products.

OUTCOMES
- Appreciative the different rubber processing techniques and safety aspects of machineries.
- Significance of compounding and mixing mechanism of rubber and its machinery.
- Acquire the knowledge of calendaring and extrusion process and its machinery.
- Realizing the different molding and vulcanization techniques.
- Manufacturing of various rubber components.

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  15

TOTAL : 45 PERIODS

REFERENCES

RP8511  RUBBER MATERIALS LABORATORY  L T P C  0 0 4 2

OBJECTIVES
• To make the familiarize with simple quality control test for the given rubber latex.
• To perform simple tests for identification of elastomers.
• To carry out tests related to properties of rubber and its additives.

OUTCOMES
• Identification of rubber
• Analyze the physical properties of NR latex.
• Chemical analysis of synthetic rubber
• Able to carry out the specifications test and interpretation of data’s of various rubbers.

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

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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
OBJECTIVES

To make the student to familiarize with
• Mixing studies of various rubbers
• Processing and curing studies of various rubbers.
• Preparation of samples for different testing of rubbers and its hands on experience.

OUTCOMES

• Operate and mix rubber compound using 2-roll mixing mill.
• Optimize the cure parameters of various rubber compounds.
• Mold rubber compounds using molds such as tensile, flex, buttons.
• Demonstration of the skill acquired to operate and analyze the problems in various rubbers processing equipment.
• Capability to carry out testing of rubber compounds and observe the behavior of the material under the test conditions.
• To perform the cure characteristics and mechanical testing of rubbers

LIST OF EXPERIMENTS

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
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  LTPC

3003

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

OUTCOMES

• Understand the principles of management.
• Familiarize with inventory management and its cost analysis.
• To understand the different principles and techniques of management in planning, organizing, directing and controlling.
• Gain the knowledge of methods of operation management.
• Gain the knowledge on the application of the principles in an organization

UNIT I  INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS  9


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UNIT II  PLANNING

UNIT III  ORGANISING

UNIT IV  DIRECTING

UNIT V  CONTROLLING
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
OBJECTIVES

To make the student to familiarize with

- Theory of metal cutting and lathe operations
- Principles of special machine tools and its application in making a mould.
- Various materials, properties and heat treatment process for mould.
- Various unconventional machining and CNC process to make a mould.

OUTCOMES

- Ability to understand different components of mould and die.
- Able to design and draw moulds and dies.
- Able to understand mould design concepts.
- Gain the knowledge on various mould manufacturing techniques.
- To gain idea on mould materials and machining processes.

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

Electric Discharge Machining (EDM)- working Principle. Parameters-Surface Finish and MRR- electrode - Wire cut EDM – Applications. Chemical machining and Electro-Chemical

UNIT V CNC MACHINE TOOLS AND PART PROGRAMMING


REFERENCES

RP8602 POLYMER CHARACTERISATION TECHNIQUES

OBJECTIVES
- To impart the knowledge on chemical analysis of different polymers.
- To enlighten the students with various instrumental techniques for the analysis.
- To highlight methods used for the study of thermal and physical properties of polymers.

OUTCOMES
- Chemical analysis of different polymers.
- Physical characteristics of polymers.
- The polymers using instrumental methods for analysis.
- The thermal properties of polymers and molecular weight of polymers.
- And interpret and analyze the given data of any polymeric material.

TOTAL : 45 PERIODS
UNIT I CHEMICAL METHODS
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

UNIT III RHEOLOGICAL CHARACTERIZATION

UNIT IV THERMAL ANALYSIS

UNIT V CHROMATOGRAPHIC CHARACTERIZATION
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

REFERENCES

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

OBJECTIVES
• To impart the knowledge to design rubber compound and product.
• To estimate the compound cost.

OUTCOMES
• Understanding the principle of compounding, mixing and compound design.
• Understanding the cure mechanism of various rubber and its vulcanizing agents.
• Acquire the knowledge of functions and applications of reinforcing fillers and other rubber additives.
• Ability to apply the concept of science in various additives, design a formulation for a specific requirement.
• Demonstrate the role of rubber elasticity in product application
• Understand rubber application in load bearing, sealing and vibration control

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
UNIT IV INDIVIDUAL RUBBER FORMULATIONS
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
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

HS8561 EMPLOYABILITY SKILLS L T P C
(LAB / PRACTICAL COURSE) 0 0 2 1
(Common to all branches of Fifth or Sixth Semester B.E / B.Tech programmes)

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.
OUTCOMES
• Development in soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job
• Enhancement in the performance of students at placement, interviews, group discussion and other recruitment exercises.

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 L T P C 0 0 4 2

OBJECTIVE
• To make the students to familiarize in mould design softwares, construction and design of mould and dies.

OUTCOMES
• Ability to use Mould design softwares.
• Ability to understand different components of mould and die.
• Able to design and draw molds and dies.

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

OBJECTIVE

• To provide hands on experience in various plastics processing equipments, sample preparation and testing.

OUTCOMES

• Apply practical skills in handling various plastic processing equipments
• To prepare and characterize the product for testing
• Understand the importance of standards and specifications.
• Familiarization about various test methods on Plastics used in industry.
• Access and analyze the properties and performance of the plastic products in service condition.

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**
OBJECTIVES
• To impart the fundamentals of polymer composites and its applications.
• To know about manufacture, properties and application of polymer and fibre.

OUTCOMES
• Classify the different type of polymeric composites and its applications.
• Select different types of matrix and reinforcement materials.
• Ability to select the process for fabrication of polymer composites.
• Relate theoretical knowledge with typical products and its stress–strain behavior.
• Aware of different testing and characterization of polymer composites.

UNIT I  INTRODUCTION TO COMPOSITES

UNIT II  MATERIALS USED IN POLYMER COMPOSITES
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
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
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
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

OBJECTIVES
• To impart the knowledge of pneumatic tyre, tyre components and their functions.
• To make the students aware of tyre cords and its reinforce mechanism, tyre building and tyre properties.

OUTCOMES
• Understand the materials and methods of various tyre components and their properties.
• Gain the knowledge of the science behind pneumatic tyre of various sizes and end use.
• Know the tyre cords and its reinforcement mechanism.
• Identify the tyre stress, deformation, traction and wear.
• Evaluate the tyre properties.

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

REFERENCES

TOTAL : 45 PERIODS
OUTCOMES

- Helps the faculty members to assess the students’ level of interest in career planning in rubber, plastics, composites, management or in entrepreneurship.
- Recall and judge the depth of understanding in various subjects which had been taught in the previous semesters.

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

OUTCOMES

- Understanding the importance of getting hands on experience by industrial training.
- Able to visualize and get trained in the real time applications in industry.
- Capable to prepare a technical report and present cogently
- Demonstrate an understanding about industrial practice related to rubber, plastics and related fields (like tyre industry

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
OBJECTIVE

• Capability to think and work independently towards conceptualizing a process, a product or a fabrication.

OUTCOME

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

OUTCOMES

• Demonstrate an ability to think and work independently towards conceptualizing a process, a product or a fabrication
• Acquire confidence in giving a technical presentation to an expertise or professional from industry

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
OBJECTIVES

- Study the basic nano technology and nano science.
- Understand interdisciplinary nature of this field.
- Understand the importance role of physics, chemistry, biology.
- Recognize that the rules of nano science are fundamentally different than those we experience.
- Study the basic fabrication strategies of nano science.

OUTCOMES

Students will able to:

- Acquire the knowledge of basics of nanotechnology, nanoscience and its inter-disciplinary nature.
- Understand the different preparation methods for nanomaterials.
- Knowledge on patterning and lithography of nanoscale devices.
- Knowledge of clean room environment, specification and design.
- Enable to know characterization techniques of nano materials.

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

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 CHARACTERISATION TECHNIQUES

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

OBJECTIVES
- Students become aware of the importance of adhesive and coatings.
- Student gets detailed knowledge about adhesive types, dormulation principles and their uses.
- Students get detailed about preparation and uses of paints and coatings.
OUTCOMES
- Understand the fundamentals of adhesives, adhesion mechanism and thermodynamics of adhesion and types of substrates.
- Acquire the knowledge of natural and rubber based adhesives.
- Acquaint of uses of adhesives in civil, automobile, aerospace, electrical & electronics industries.
- Ability to the select adhesives and adhesion process and its applications
- Realize the importance of surface preparation, composition of paints and surface coating applications.

UNIT I  FUNDAMENTALS OF ADHESION  8

UNIT II  NON REACTIVE ADHESIVES  10

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

UNIT IV  SURFACE COATINGS  10
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  7
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

OBJECTIVE
• To impart the knowledge on advanced polymer processing techniques.

OUTCOME
• Able to demonstrate the ability to process advanced injection moulding, extrusion and blow moulding process.

UNIT I ADVANCED INJECTION MOULDING PROCESS - I  9

UNIT II ADVANCED INJECTION MOULDING PROCESS – II  9
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  9

UNIT IV ADVANCED BLOW MOULDING - I  9
UNIT V  ADVANCED BLOW MOULDING – II


TOTAL : 45 PERIODS

REFERENCES

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

OBJECTIVE
• To impart the fundamentals of biopolymers and biocomposites.

OUTCOMES
• Able to prepare biopolymers.
• Able to use biopolymers for various applications.

UNIT I  POLYMERS & SUSTAINABILITY


UNIT II  RESOURCES FOR BIOPOLYMERS

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

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


UNIT V BIOPOLYMER APPLICATIONS FOR AGRICULTURE

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
OBJECTIVES

• To impart the knowledge of statistical process control, sampling procedures and failure data analysis.

OUTCOMES

• Able to use different quality control procedures.
• Able to use experimental design, reliability and failure data analysis

UNIT I STATISTICAL PROCESS CONTROL

Quality control – Definition – Quality Assurance Variation in process – Factors – control charts – variables XR and Xσ, - Attributes P, C and U-Chart Establishing and interpreting control charts process capability – Quality rating – Short run SPC.

UNIT II ACCEPTANCE SAMPLING

Lot by lot sampling types – Probability of acceptance in single, double, multiple sampling plans – OC curves – Producer’s risk and consumer’s risk. AQL, LTPD, AOQL, Concepts Designof 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


UNIT IV RELIABILITY AND ITS PREDICTION


UNIT V FAILURE DATA ANALYSIS

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 POLYMERST L T P C
3 0 0 3

OBJECTIVES
• To impart the knowledge of fracture behaviour in polymers

OUTCOMES
• Understand the fatigue behaviour and fracture mechanism.
• Able to do fatigue design and testing of composite materials and structures.

UNIT I FATIGUE OF STRUCTURES

UNIT II STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR
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
Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations - fatigue fracture surfaces.
UNIT IV  FRACTURE MECHANICS
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
Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

REFERENCES

RP8006  LATEX SCIENCE AND TECHNOLOGY

OBJECTIVES
• To understand the characteristics of latex, its classification and source.
• To impart the fundamentals of latex compounding and processing.
• To study about the manufacture, properties and applications of synthetic latex.

OUTCOMES
Able to perform compounding and processing of latex.
• Able to understand the properties and application of synthetic latex.

UNIT I  LATEX XHARACTERISTICS AND CONCENTRATION METHODS
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.

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

- To impart the fundamentals of polymer blends and its properties,

OUTCOMES

- Able to prepare polymer blends using compatibilizers.
- Able to understand the morphology and microstructure of the blends.
- Able to understand the applications of the polymers blends.

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

Miscible and immiscible elastomers blends – Thermoplastic vulcanizates – Thermoset –

TOTAL: 45 PERIODS

REFERENCES


RP8008 PLASTICS PRODUCT AND MOULD DESIGN

OBJECTIVE

- To make the student to understand the design factors involved in plastic products and mould design

OUTCOME

Students able to design plastic products, injection mould and extruder die.

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 design-Simple case study.

UNIT V EXTRUSION DIES AND MAINTENANCE OF MOLDS


REFERENCES

OBJECTIVES

• To emphasize the fundamentals and importance of plastics recycling.
• To impart the knowledge on various sorting and separation techniques.
• To highlight recycling procedures for commodity and engineering plastics.
• To familiarize rubber recycling procedures.

OUTCOMES

Students will be able to:

• Apply the principles of various methods of recycling and to relate the methods to various polymeric materials.
• Understand the need for recycling and classification of recycling methods.
• Sort and separate mixed plastics.
• Recycle domestic and engineering thermoplastics.
• Acquire the knowledge of various techniques for rubber recycling.

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


REFERENCES

OBJECTIVES

• To understand the different types of packaging.
• To select polymers for packaging applications.
• To impart the knowledge of testing of packaging materials.

OUTCOMES

• Able to understand the functions and design of packaging.
• Able to manufacture packaging materials.

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 moulding; 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

OBJECTIVE:
To enable the students to understand the basic variation between the raw materials used for polyurethane production, methods of polyurethane production and analysis of the raw materials products.

OUTCOMES:
Upon completing this course, the students
- Will understand the importance of poly urethane in engineering application
- Will familiarize about manufacturing techniques for poly urethane
- Will attain the knowledge of qualitative and quantitative analysis of polyurethane

UNIT I PRINCIPLES OF PU CHEMISTRY AND SPECIAL APPLICATIONS

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.

REFERENCES

TOTAL: 45 PERIODS

OBJECTIVE
To enable the students to learn the manufacturing technique for different rubber products.

OUTCOMES
Upon completing this course, the students
• Will have the knowledge of rubber product manufacturing technique.
• Will understand about processing of rubbers
• Will familiarize in latex product manufacturing process

UNIT I    INTRODUCTION  8
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  8
Functional design – aesthetic design – Incorporating – quality, durability and reliability into design – design for case of manufacture and maintenance – design optimization.

UNIT III PROCESS PLANNING  8

UNIT IV  ESTIMATING, COSTING AND ELEMENTS OF COST  12

UNIT V ANALYSIS OF OVERHEAD EXPENSES:  9

TOTAL : 45 PERIODS
REFERENCES

RP8013 RUBBER COMPONENTS IN AUTOMOBILES L T P C
3 0 0 3

OBJECTIVES
To provide the plastics / rubber components in automobiles.

OUTCOMES:
Upon completing this course, the students
- Will attain the knowledge in role of additives at rubber.
- Will demonstrate the mixing methods
- Will have knowledge in selection of compounding ingredients

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
Types of couplings – Specification and selection – Torque vs deflection relationship – Brake
REFERENCES

2. Gobel E.F., Rubber Springs Design.
4. The scope of the subject will include studies on the following components:
   - Cylinder head gasket: ACM, Silicon
   - Oil Pan gasket: ACM
   - Blow-by Circuit hose: NBR / PVC, CM, FKM/EVA, FKM/VMQ
   - Vacuum Hose: CR, CM, AEM
   - Oil Circuit and blow-by seals: AEM, FPM, HNBR
   - Oil hose: AEM
   - Oil filter base gasket: NBR, AEM and ACM
   - Dipstick guide: HNBR
   - Dipstick seal: NBR, FPM
   - Drain plug seal: NBR, ACM
   - Air filter intake duct: TPV-(EPDM+PP)
   - Throttle valve intake duct: TPV-(EPDM+PP), EPDM, NBR/PVC, CM, ECO
   - Throttle valve seals: NBR
   - Air intake manifold seals: NBR
   - Cooling Hose: EPDM
   - Cooling Seals: EPDM

MG8651 ENGINEERING MANAGEMENT  L T P C 3 0 0 3

OBJECTIVE
To provide the principles of management and its cost analysis.

OUTCOMES
- Understand the principles of management.
• Familiarize with inventory management and its cost analysis.
• Gain the knowledge of methods of operation management.
• Comprehend the methods of financial management.

UNIT I PRINCIPLES OF MANAGEMENT & PERSONNEL MANAGEMENT
General Principles of Management – Management Functions – Organization – Types –
Comparison – Functions of Personnel Management – Recruitment – Training Leadership/
Motivation – Communication – Conflict- Industrial Relations – Trade unions.

UNIT II INVENTORY MANAGEMENT
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
Plant Location – Layout – Materials Handling – Method Study – Time Study Ergonomics –
Aggregate Planning – Value Analysis

UNIT IV FINANCIAL MANAGEMENT
Capital – Types – Sources – Break Even Analysis – Financial Statements – Income Statement

UNIT V MARKETING MANAGEMENT
Functions of Marketing – Sales Promotion Methods – Advertising – Product Packaging –
Marketing Variables – Distribution Channels – Organisation – Market research – Market
Research Techniques.

TOTAL : 45 PERIODS

REFERENCES
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

OUTCOMES
Students will able to:
- Understand the different principle, practices of TQM to achieve quality.
- Apply the various TQM tools and techniques for continuous improvement.
- Enable to gain knowledge about modern tools of management, various data collection methods, statistical analysis and interpretation.
- Understand the importance of ISO and quality systems.
- Implement TQM in manufacturing and service sectors to achieve quality.

UNIT I INTRODUCTION 9

UNIT II TQM PRINCIPLES 9
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 9
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking–
Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCE BOOKS

AE8071 EXPERIMENTAL STRESS ANALYSIS

OBJECTIVE
To study the various experiments techniques involving the measurements of displacements, stresses, stains, in structural components

113
OUTCOMES

- Knowledge of stress and strain measurements in loaded components.
- Acquiring information's the usage of strain gauges and photo elastic techniques of measurement.
- Knowledge in NDT in stress analysis

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

OBJECTIVES:
- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

OUTCOMES:
- Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

UNIT I INTRODUCTION

UNIT II STATIC ANALYSIS
UNIT III  DYNAMICS ANALYSIS

UNIT IV  HEAT TRANSFER AND FLUID FLOW ANALYSIS

UNIT V  AUTOMOTIVE APPLICATION
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

REFERENCES
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.

OUTCOMES
Able to gain knowledge on entrepreneurship.
- Able to manage financing and accounting techniques.

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

UNIT V  SUPPORT TO ENTREPRENEURS
Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective
TEXT BOOKS

REFERENCES

PR8451 MACHINE COMPONENTS DESIGN

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

OUTCOMES
• Get an idea about gradual and variable stress induced in various machine elements.
• Familiarize with design practice of detachable and permanent joints in machines.
• Understanding the design process of shaft, coupling and brakes in machines.
• Realize with the design of gears and belt drives in power transmission.
• Gain the knowledge of design of springs and bearings in machines.

UNIT I INTRODUCTION
Consideration - Standards and Codes – Selection of Materials – Design against Static and Dynamic Load – Modes of Failure, Factor of Safety, Principal Stresses, Theories of Failure, Stress Concentration, Stress Concentration Factors, Variable Stress, Fatigue Failure, Endurance Limit, Design for Finite and Infinite Life, Soderberg and Goodman Criteria.

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 GEARS 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

TOTAL: 60 PERIODS

TEXT BOOK

REFERENCES
OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.
UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.
UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME :
• Engineering students will acquire the basic knowledge of human rights.

REFERENCES: