ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
R - 2013
B.E. PRODUCTION ENGINEERING
I – VIII SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

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**Total number of credits to be earned for award of the degree = 195**

## Electives for B.E. Production Engineering

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### Semester VI (Elective II)

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### SEMESTER VIII (Elective V)

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OBJECTIVES:
- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT I
9+3
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
9+3
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and 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) - Process descriptions (general/specific) - Definitions - Recommendations – Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Reading exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III
9+3
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 and effect / compare and 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
9+3
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 and 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 and telecast from Radio and 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 and Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
Learners should be able to
• speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
• write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
• read different genres of texts adopting various reading strategies.
• listen/view and comprehend different spoken discourses/excerpts in different accents

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

WEBSITES:

TEACHING METHODS:
• Lectures
• Activities conducted individually, in pairs and in groups like self introduction, peer introduction, group poster making, grammar and vocabulary games, etc.
• Discussions
• Role play activities
• Short presentations
• Listening and viewing activities with follow up activities like discussion, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc.
EVALUATION PATTERN:

Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like

- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

All the four skills are to be tested with equal weightage given to each.

- Speaking assessment: Individual speaking activities, Pair work activities like role play, Interview, Group discussions
- Reading assessment: Reading passages with comprehension questions graded from simple to complex, from direct to inferential
- Writing assessment: Writing paragraphs, essays etc. Writing should include grammar and vocabulary.
- Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content.

End Semester Examination: 80%

MA6151 MATHEMATICS – I

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.

UNIT I MATRICES


UNIT II SEQUENCES AND SERIES

UNIT III  APPLICATIONS OF DIFFERENTIAL CALCULUS  9+3
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals.

UNIT IV  DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES  9+3

UNIT V  MULTIPLE INTEGRALS  9+3

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
• This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

TEXT BOOKS:

REFERENCES:

PH6151  ENGINEERING PHYSICS – I  L T P C
3 0 0 3

OBJECTIVES:
• To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I  CRYSTAL PHYSICS  9
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment) - Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)
UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS
Elasticity- Hooke’s law - Relationship between three modulii of elasticity (qualitative) – stress-strain diagram – Poisson’s ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young’s modulus by uniform bending- I-shaped girders

UNIT III QUANTUM PHYSICS

UNIT IV ACOUSTICS AND ULTRASONICS
Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications - Sonogram

UNIT V PHOTONICS AND FIBRE OPTICS
Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011
OBJECTIVES:

- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I POLYMER CHEMISTRY

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

UNIT II CHEMICAL THERMODYNAMICS

Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV PHASE RULE AND ALLOYS


UNIT V NANOCHEMISTRY

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.
TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

OBJECTIVES:
The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

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

OUTCOMES:
At the end of the course, the student should be able to:
• Design C Programs for problems.
• Write and execute C programs for simple applications.

TEXTBOOKS:

REFERENCES:

GE6152  ENGINEERING GRAPHICS  L T P C
2  0  3  4

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

CONCEPTS AND CONVENTIONS (Not for Examination)
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 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

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

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course the student will be able to
- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.

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.

GE6161

OBJECTIVES:
The student should be made to:
- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

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 – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

OUTCOMES:
At the end of the course, the student should be able to:
- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.

(or)
Server with C compiler supporting 30 terminals or more.
OBJECTIVES:
• To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings:
(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:

Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

Welding:
(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

Basic Machining:
(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:
(a) Forming & Bending:
(b) Model making – Trays, funnels, etc.
(c) Different type of joints.

Machine assembly practice:
(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example –
Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

OUTCOMES:
• ability to fabricate carpentry components and pipe connections including plumbing works.
• ability to use welding equipments to join the structures.
• ability to fabricate electrical and electronics circuits.

REFERENCES:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL
1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools: (a) Rotary Hammer 2 Nos
   (b) Demolition Hammer 2 Nos
   (c) Circular Saw 2 Nos
   (d) Planer 2 Nos
   (e) Hand Drilling Machine 2 Nos
### MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
9. Study-purpose items: centrifugal pump, air-conditioner One each.

### ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos
   (b) Digital Live-wire detector 2 Nos

### ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

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**OBJECTIVES:**

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

**LIST OF EXPERIMENTS**

(Any FIVE Experiments)

1. (a) Determination of Wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of Young’s modulus by Non uniform bending method
6. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge
OUTCOMES:
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Diode laser, lycopodium powder, glass plate, optical fiber.
2. Ultrasonic interferometer
3. Spectrometer, mercury lamp, grating
4. Lee’s Disc experimental set up
5. Traveling microscope, meter scale, knife edge, weights
6. Carey foster’s bridge set up
   (vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY- I

OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. Determination of DO content of water sample by Winkler’s method.
2. Determination of chloride content of water sample by argentometric method.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Determination of strength of acids in a mixture using conductivity meter.
5. Estimation of iron content of the water sample using spectrophotometer.
   (1,10- phenanthroline / thiocyanate method).
7. Conductometric titration of strong acid vs strong base.

OUTCOMES:
- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

REFERENCES:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Iodine flask - 30 Nos
2. pH meter - 5 Nos
3. Conductivity meter - 5 Nos
4. Spectrophotometer - 5 Nos
5. Ostwald Viscometer - 10 Nos
OBJECTIVES:
- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
- To make them acquire language skills at their own pace by using e-materials and language lab components.

UNIT I
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like 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 and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. ‘can’) - Homophones (e.g. ‘some’, ‘sum’); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

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

UNIT III
Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for 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 and vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials – Attending a meeting and writing minutes.

UNIT IV
Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping 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 and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V
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 – Checklist - 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; Language Lab - Different models of group discussion.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
Learners should be able to
• speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
• write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
• read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
• listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

Websites
2. http://owl.english.purdue.edu
TEACHING METHODS:
- Lectures
- Activities conducted individually, in pairs and in groups like individual writing and presentations, group discussions, interviews, reporting, etc
- Long presentations using visual aids
- Listening and viewing activities with follow up activities like discussions, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc
- Projects like group reports, mock interviews etc using a combination of two or more of the language skills

EVALUATION PATTERN:

Internal assessment: 20%
- 3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like
  - Project
  - Assignment
  - Report
  - Creative writing, etc.
All the four skills are to be tested with equal weightage given to each.
- ✔ Speaking assessment: Individual presentations, Group discussions
- ✔ Reading assessment: Reading passages with comprehension questions graded following Bloom’s taxonomy
- ✔ Writing assessment: Writing essays, CVs, reports etc. Writing should include grammar and vocabulary.
- ✔ Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content graded following Bloom’s taxonomy.

End Semester Examination: 80%

MA6251 MATHEMATICS – II
L T P C
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.

UNIT I VECTOR CALCULUS
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.
UNIT II  ORDINARY DIFFERENTIAL EQUATIONS 9+3
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III  LAPLACE TRANSFORM 9+3

UNIT IV  ANALYTIC FUNCTIONS 9+3
Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w = z+k, kz, 1/z, z^2, e^z and bilinear transformation.

UNIT V  COMPLEX INTEGRATION 9+3
Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula – Taylor’s and Laurent’s series expansions – Singular points – Residues – Cauchy’s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
• The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I  CONDUCTING MATERIALS

UNIT II  SEMICONDUCTING MATERIALS

UNIT III  MAGNETIC AND SUPERCONDUCTING MATERIALS
Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High T_c superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV  DIELECTRIC MATERIALS

UNIT V  ADVANCED ENGINEERING MATERIALS

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have the knowledge on physics of materials and that knowledge will be used by them in different engineering and technology applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY
9
Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement -boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION
9

UNIT III ENERGY SOURCES
9
Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator-classification of nuclear reactor - light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells:Types of batteries- alkaline battery- lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H₂ -O₂ fuel cell- applications.

UNIT IV ENGINEERING MATERIALS
9
Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V FUELS AND COMBUSTION
9

TOTAL: 45 PERIODS
OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:


REFERENCES:


GE6252 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVES:

- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics
- To impart knowledge of communication.

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS

- Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS


UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS


UNIT IV DIGITAL ELECTRONICS

UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING  12

TOTAL: 60 PERIODS

OUTCOMES:
• ability to identify the electrical components explain the characteristics of electrical machines.
• ability to identify electronics components and use of them to design circuits.

TEXT BOOKS:

REFERENCES:

GE6253 ENGINEERING MECHANICS L T P C
3 1 0 4

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

UNIT I  BASICS AND STATICS OF PARTICLES  12

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

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12
Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas –
Principal axes of inertia-Mass moment of inertia —mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS
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.

OUTCOMES:
• ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
• ability to analyse the forces in any structures.
• ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

REFERENCES:

GE6261 COMPUTER AIDED DRAFTING AND MODELING LABORATORY

OBJECTIVES:
• To develop skill to use software to create 2D and 3D models.

LIST OF EXERCISES USING SOFTWARE CAPABLE OF DRAFTING AND MODELING
1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and
dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

TOTAL: 45 PERIODS

OUTCOMES:
• ability to use the software packers for drafting and modeling
• ability to create 2D and 3D models of Engineering Components

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pentium IV computer or better hardware, with suitable graphics facility</td>
<td>30 No.</td>
</tr>
<tr>
<td>2.</td>
<td>Licensed software for Drafting and Modeling.</td>
<td>30 Licenses</td>
</tr>
<tr>
<td>3.</td>
<td>Laser Printer or Plotter to print / plot drawings</td>
<td>2 No.</td>
</tr>
</tbody>
</table>

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

OBJECTIVES:
• To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. Determination of Young’s modulus by uniform bending method
2. Determination of band gap of a semiconductor
3. Determination of Coefficient of viscosity of a liquid – Poiseuille’s method
4. Determination of Dispersive power of a prism - Spectrometer
5. Determination of thickness of a thin wire – Air wedge method
6. Determination of Rigidity modulus – Torsion pendulum

OUTCOMES:
• The students will have the ability to test materials by using their knowledge of applied physics principles in optics and properties of matter.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Traveling microscope, meter scale, Knife edge, weights
2. Band gap experimental set up
3. Burette, Capillary tube, rubber tube, stop clock, beaker and weighing balance
4. spectrometer, prism, sodium vapour lamp.
5. Air-wedge experimental set up.
6. Torsion pendulum set up.
   (vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY - II

OBJECTIVES:
• 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.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. Determination of alkalinity in water sample
2. Determination of total, temporary & permanent hardness of water by EDTA method
3. Estimation of copper content of the given solution by EDTA method
4. Estimation of iron content of the given solution using potentiometer
5. Estimation of sodium present in water using flame photometer
6. Corrosion experiment – weight loss method
7. Conductometric precipitation titration using BaCl$_2$ and Na$_2$SO$_4$

TOTAL: 30 PERIODS

OUTCOMES:
• The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

REFERENCES:
• Laboratory classes on alternate weeks for Physics and Chemistry.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Potentiometer - 5 Nos
2. Flame photo meter - 5 Nos
3. Weighing Balance - 5 Nos
4. Conductivity meter - 5 Nos

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (30 Nos each)
OBJECTIVES

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I   PARTIAL DIFFERENTIAL EQUATIONS
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange’s linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II   FOURIER SERIES

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV   FOURIER TRANSFORMS

UNIT V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES

- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOKS

REFERENCES

PR6301 BASIC 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.

UNIT I LATHE

UNIT II SHAPER, PLANER AND SLOTTER

UNIT III DRILLING

UNIT IV MILLING
UNIT V  GRINDING


TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this subject, the students can able to identify different manufacturing techniques for the Industrial component production.

TEXT BOOKS

REFERENCES

PR6302  BASICS OF THERMODYNAMICS AND THERMAL ENGINEERING  L T P C
3 1 0 4

OBJECTIVES
• To introduce fundamental concepts in thermodynamics, heat transfer, propulsion and refrigeration and air conditioning.

UNIT I  BASIC THERMODYNAMICS  16

UNIT II  AIR CYCLE AND COMPRESSORS  12
Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency . Mean effective pressure, Reciprocating compressors.

UNIT III  STEAM AND JET PROPULSION  12

UNIT IV  REFRIGERATION AND AIR-CONDITIONING  10
Principles of Psychrometry and refrigeration - Vapour compression - Vapour absorption types - Co-efficient of performance, Properties of refrigerants – Basic Principle and types Air conditioning.
UNIT V  HEAT TRANSFER

TOTAL (L:45+T:15): 60 PERIODS

(Use of standard thermodynamic tables, Mollier diagram and Refrigerant property tables are permitted)

OUTCOMES:
• Upon completion of this subject, the students can able to apply basic thermodynamics principles to different thermal engines jet propulsion system and refrigeration and air conditioning systems.

TEXT BOOKS

REFERENCES

PR6303 ENGINEERING METALLURGY

OBJECTIVES:
• To introduce the various concepts of metallurgy, metallurgical structures and mechanical properties, testing of metals
• To impart the knowledge on metallurgy with respect to foundry and welding Processes

UNIT I  CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS

UNIT II  HEAT TREATMENT
UNIT III  FERROUS, NON FERROUS METALS

UNIT IV  MECHANICAL PROPERTIES AND TESTING

UNIT V  WELDING AND FOUNDRY METALLURGY

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this subject, the students can identify suitable heat treatment different materials in mechanical industries and also perform testing to know the mechanical properties of the materials.

TEXT BOOKS

REFERENCES

CE6451  FLUID MECHANICS AND MACHINERY

OBJECTIVES:
- The applications of the conservation laws to flow through pipes and hydraulic machines are studied
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS
Units and dimensions - Properties of fluids - mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.
UNIT II FLOW THROUGH CIRCULAR CONDUITS

UNIT III DIMENSIONAL ANALYSIS
Need for dimensional analysis – methods of dimensional analysis – Similitude – types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS

UNIT V TURBINES

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
• Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

EE6351 ELECTRICAL DRIVES AND CONTROLS

OBJECTIVES
• To understand the basic concepts of different types of electrical machines and their performance.
• To study the different methods of starting D.C motors and induction motors.
• To study the conventional and solid-state drives

UNIT I INTRODUCTION
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors
UNIT II  DRIVE MOTOR CHARACTERISTICS  9
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors –
Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three
phase induction motors.

UNIT III  STARTING METHODS  8
Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase
squirrel cage and slip ring induction motors.

UNIT IV  CONVENTIONAL AND SOLID STATE SPEED CONTROL
OF D.C. DRIVES  10
Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control
system - Using controlled rectifiers and DC choppers –applications.

UNIT V  CONVENTIONAL AND SOLID STATE SPEED CONTROL
OF A.C. DRIVES  10
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power
recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon Completion of this subject, the students can able to explain different types of electrical
machines and their performance

TEXT BOOKS

REFERENCES

PR6311  BASIC MACHINING PROCESS LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
• To introduce different machining process and machine tool to develop components.

LIST OF EXPERIMENTS:
1. Lathe: Facing, Plain turning, Step Turning
2. Lathe: Taper Turning, Threading, Knurling
3. Lathe: Multi start Threading, Burnishing
4. Shaper: Cube
5. Shaper: Cube, V-Block
6. Drilling: Counter sinking, Counter Boring, Tapping
7. Milling Vertical: Surfacing, Pocket Milling
8. Milling Horizontal: Polygonal shape milling
9. Grinding: Surface & Cylindrical grinding
10. Slotting: Machining an internal spline

TOTAL: 45 PERIODS
OUTCOMES:
- Ability to use the machine tool and processes to shape and fabricate the components.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lathe</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Drilling Machine</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Shaper</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Vertical Milling Machine</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Horizontal Milling Machine</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Surface Grinding Machine</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Cylindrical Grinding Machine</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Slotting Machine</td>
<td>2</td>
</tr>
</tbody>
</table>

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

CE6461 FLUID MECHANICS AND MACHINERY LABORATORY

OBJECTIVES:
- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orifice meter setup</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Venturi meter setup</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Rotameter setup</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pipe Flow analysis setup</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Centrifugal pump/submergible pump</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Reciprocating pump setup</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Gear pump setup</td>
<td>1</td>
</tr>
</tbody>
</table>

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS
OBJECTIVES:
• To validate the principles studied in theory by performing experiments in the laboratory

LIST OF EXPERIMENTS
1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt and DC Series generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

OUTCOMES
• Ability to perform speed characteristic of different electrical machine

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC Shunt motor</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>DC Series motor</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>DC shunt motor-DC Shunt Generator set</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>DC Shunt motor-DC Series Generator set</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Single phase transformer</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Three phase alternator</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Three phase synchronous motor</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Three phase Squirrel cage Induction motor</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Three phase Slip ring Induction motor</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Single phase Induction motor</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES

- This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 10+3


UNIT II INTERPOLATION AND APPROXIMATION 8+3

Interpolation with unequal intervals - Lagrange’s interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Romberg’s method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson’s 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3


UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

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 (L:45+T:15): 60 PERIODS

OUTCOMES

- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS


REFERENCES


CE6306  STRENGTH OF MATERIALS  

L T P C  3 1 0 4

OBJECTIVES:
To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I  STRESS, STRAIN AND DEFORMATION OF SOLIDS  9

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM  9

UNIT III  TORSION  9
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV  DEFLECTION OF BEAMS  9
Double Integration method – Macaulay’s method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V  THIN CYLINDERS, SPHERES AND THICK CYLINDERS  9
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lamé’s theorem.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
• Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the theory of metal cutting
- To understand the concepts of gear manufacture
- To understand CNC machines constructional features, working and programming

UNIT I MECHANICS OF METAL CUTTING 10

UNIT II TOOL MATERIAL, TOOL WEAR AND TOOL LIFE 9

UNIT III GEAR MANUFACTURE 8

UNIT IV CNC MACHINES 9

UNIT V CNC PROGRAMMING 9

OUTCOMES:
- Upon completion of this course, the students can able to perform machining operations and study the forces tool life and wear can select proper tool materials for machining difficult materials and generate CNC processing to perform metal cutting operation.

TEXT BOOKS

REFERENCES
OBJECTIVES:
- To understand the basic concepts of mechanisms and machinery

UNIT I  MECHANISMS  14

UNIT II  FRICTION  12

UNIT III  GEARING AND CAMS  12

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

UNIT V  VIBRATION  11

TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to predict the force analysis in mechanical system and related vibration issues and can able to solve the problem

TEXT BOOKS

REFERENCES
OBJECTIVES:
- To understand the working principle of hydraulic and pneumatic components and its selection
- To design hydraulic and pneumatic circuits for different applications

UNIT I  INTRODUCTION TO FLUID POWER & HYDRAULICS PRINCIPLE  12
Introduction to fluid power controls – Hydraulics and pneumatics – Selection criteria, Application of
Fluid power, Application of Pascal’s Law, equation, Transmission and multiplication of force –
Pressure Losses – Fluids, selection & properties – ISO symbols.

UNIT II  FLUID POWER DRIVES  12
Fluid Power drives – Pumps – working principle and construction details of Gear, vane and piston
pumps, Hydraulic motors, Hydrostatic transmission drives and characteristics, Hydraulic supply
components Pneumatic power supply – compressors, air distribution, air motors.

UNIT III  FLUID POWER ELEMENTS  12
Control valves – pressure, flow, direction - working principle and construction – Special type - valves –
Cartridge, modular, proportional, and servo – Selection and actuation methods. Actuators – Selection
and specification, cylinders, mounting, cushioning, pipe fittings – Fluid conditioning elements –
Accumulators.

UNIT IV  HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN  12
Design of Hydraulic and pneumatic circuits for automation, selection and specification of circuit
components, sequencing circuits, cascade, and karnaugh – Veitch map method – Regenerative,
speed control, synchronizing circuits.

UNIT V  ELECTRO PNEUMATICS AND PLC CIRCUITS  12
Use of electrical timers, switches, solenoid, relays, proximity sensors etc. electro pneumatic
sequencing Ladder diagram – PLC – elements, functions and selection – PLC programming – Ladder
and different programming methods - Sequencing circuits.

TOTAL: 60 PERIODS

OUTCOME:
- Identify hydraulic and pneumatics components.
- Ability to design hydraulic and pneumatics circuits.

TEXT BOOKS:

REFERENCES:
OBJECTIVES
- To understand the basics of welding and to know about the various types of welding processes

UNIT I GAS AND ARC WELDING PROCESSES: 9
Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II RESISTANCE WELDING PROCESSES: 9
Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III SOLID STATE WELDING PROCESSES: 9
Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV OTHER WELDING PROCESSES: 9

UNIT V DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS 9
Various weld joint designs – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

OUTCOMES:
- Upon completion of this course, the students can able to compare different types of Welding process for effective Welding of Structural components.

TEXT BOOKS

REFERENCES
OBJECTIVES:
- To train the students in observation and interpretation of Microstructure of Engineering materials.
- To train students in Heat treatment, hardenability and surface treatment of Engineering Materials
- To train the students in testing of Foundry sand

LIST OF EXPERIMENTS:
1. Specimen preparation for macro – examination.
2. Specimen preparation for micro examination and study of Micro structure of –
   a) Carbon steel s (High, Medium, and Low)
   b) Cast Iron (Gray, White, Nodular, Malleable)
   c) Brass (70/30), Bronze (tin bronze), Al-Si alloy, cupro-nickel, Ti alloy.
4. Cooling curves
   a) Pure Metal (Pb or Sn)
   b) Alloy (Pb-Sn or Pb-Sb)
5. Heat treatments (carry out the following heat treatment and study the micro structure before and after heat treatments)
   a) Annealing
   b) Normalising
   c) Quench Hardening
   d) Tempering
6. Jominy End Quench Test
7. Foundry Sand testing
   a) Sieve analysis
   b) Strength of moulding sand
   c) Permeability of moulding sand
   d) Clay content of moulding sand
   e) Moisture content of moulding sand
8. Electro-chemical Test
   a) Electro deposition
   b) Electro-chemical etching test

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to incorporate to microstructure of different ferrous and non ferrous alloy
- Ability to perform heat treatment, surface treatment on metals.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Jominy End Quench Test</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Specimen Mounting Test with Digital Measurements</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Trinocular Microscopes with Objective Lens</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Disc Polishing Machine</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Muffle Furnace</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES
To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness.

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering- Improvement Mechanical properties Comparison
   (i) Unhardened specimen
   (ii) Quenched Specimen and
   (iii) Quenched and tempered specimen.
11. Microscopic Examination of
   (i) Hardened samples and
   (ii) Hardened and tempered samples.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to perform different destructive testing
- Ability to characteristic materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Torsion Testing Machine (60 NM Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Impact Testing Machine (300 J Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Brinell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Rockwell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Spring Testing Machine for tensile and compressive loads (2500 N)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Metallurgical Microscopes</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Muffle Furnace (800 C)</td>
<td>1</td>
</tr>
</tbody>
</table>
PR6412 COMPUTER AIDED MACHINE DRAWING LABORATORY  

OBJECTIVES
- To introduce the students the Indian standard code of practice for engineering drawing and general symbols and abbreviation used on the drawing.

LIST OF EXPERIMENTS
To provide hands on experience to develop 2D and 3D models of engineering components
1. Drawing of automobile components such as piston, connecting rod, valves, manifold and crank shaft.
2. Assembly drawing of screw jack, piston – connecting rod assembly, valve assembly, clutch assembly and gear box assembly.

TOTAL: 45 PERIODS

OUTCOMES
- Ability to develop engineering drawing for the industrial component using Indian Standard code of practice.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer nodes</td>
<td>30</td>
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<tr>
<td>2</td>
<td>Auto CAD</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Pro-E</td>
<td>5</td>
</tr>
</tbody>
</table>

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING  

OBJECTIVES
To the study of nature and the facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – 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 10
Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO$_2$, NO$_x$, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10
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 overutilization of surface and ground 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. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; 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. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

TOTAL : 45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

49
• Public awareness of environmental is at infant stage.
• Ignorance and incomplete knowledge has lead to misconceptions
• Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS:

REFERENCES:
UNIT V  MEASUREMENT OF MECHANICAL PARAMETERS

Force, torque, power:-mechanical, pneumatic, hydraulic and electrical type-Pressure measurement - Flow: Venturi, orifice, rotameter, pitot tube –Temperature: bimetallic strip, thermocouples, pyrometer, electrical resistance thermistor

TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course the student can able to learn the various linear and angular measuring equipments, their principle of operation and applications

TEXT BOOKS

REFERENCES

MF6502  METAL FORMING TECHNOLOGY

OBJECTIVES:
- To understand the principle, procedure and applications of Bulk Metal Forming and Sheet Metal Forming.

UNIT I  FUNDAMENTALS OF METAL FORMING

UNIT II  FORGING AND ROLLING

UNIT III  EXTRUSION AND DRAWING PROCESSES

UNIT IV  SHEET METAL FORMING PROCESSES
UNIT V  RECENT ADVANCES  10

TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to perform difficult forming process to make different shape components.

TEXT BOOKS:
2. Nagpal G.R. “Metal forming processes”, Khanna publishers, New Delhi, 2004

REFERENCES:

PR6502  ENGINEERING STATISTICS AND QUALITY CONTROL  L T P C
3 1 0 4

OBJECTIVES:
- To provide an introduction to fundamental concepts of statistical Process control
- Enhance the student understanding of the complexities of Statistical Analysis and control chart interpretation
- To understand the concept of reliability and its improving techniques and design of experiments

UNIT I  SAMPLING THEORY AND TESTING OF HYPOTHESIS  11

UNIT II  STATISTICAL PROCESS CONTROL  15
Variation in process – Factors – control charts – variables X R and X, , - Attributes P, C and U-Chart Establishing and interpreting control charts process capability – Quality rating – Short run SPC.

UNIT III  ACCEPTANCE SAMPLING  15
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 Design of single sampling plan – standard sampling plans for AQL end LTPD – use of standard sampling plans – Sequential sampling plan.

UNIT IV  RELIABILITY AND QUALITY  10
UNIT V
EXPERIMENTAL DESIGN AND TAGUCHI METHOD

OUTCOMES:
• Upon completion of this course, the students can able to perform statistical analysis using different control chart and able to apply concept of reliability, and design of experiment for quality improvement.

TEXT BOOKS:

REFERENCES:

PR6503 MACHINERY DESIGN

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

UNIT I INTRODUCTION

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

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

UNIT IV 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
Design of Helical Spring-Types, Materials, Static and Variable Loads-Design of Leaf Spring-Design of Journal Bearing -Antifriction Bearing-Types, Life of Bearing, Reliability Consideration, Selection of Ball and Roller Bearings

TOTAL: 60 PERIODS

53
OUTCOMES:

- Upon completion of this course, the students can able to successfully design engine components. The students can able to successfully design transmission components used in Engine and machines.

TEXT BOOKS:


REFERENCES:


PR6504 FOUNDRY TECHNOLOGY

OBJECTIVE:

- To understand the principle, procedure and applications of various foundry processes.

UNIT I CASTING PROCESS


UNIT II CASTING METALLURGY


UNIT III DESIGN OF GATING SYSTEMS

Gating systems and their characteristics; the effects of gates on aspiration; turbulence and dross trap; recent trends. Chvorinov’s Rule Riser design; risering curves; NRL method of riser design; feeding distance; risering of complex casting;

UNIT IV RECENT TRENDS IN CASTING AND FOUNDRY LAYOUT

Shell moulding, precision investment casting, CO2 moulding, centrifugal casting, Die casting, Continuous casting, Counter gravity low pressure casting, Squeeze casting and semisolid processes. Layout of mechanized foundry – sand reclamation – material handling in foundry pollution control in foundry — Computer aided design of casting.

UNIT V TESTING OF CASTINGS


TOTAL: 45 PERIODS
OUTCOME:
- Upon completion of this course, the students can able to design different casting system and use different Foundry practices to make practical component,
- To perform different testing to study the defect in the casting and apply engineering skills to minimise the defects.

TEXT BOOKS:

REFERENCES

PR6511 CNC MACHINE LABORATORY

OBJECTIVES:
To train the students to write CNC Programing to simulate tool path simulation for different components.

LIST OF EXPERIMENTS
1. Study of different control systems and NC codes.
2. Program for Turning, Facing operation.
3. Program for circular interpolation, Taper turning operation
4. Program for thread cutting operation
5. Program using Do-Loop and Sub-routine.
6. Program for profile milling operation, circular interpolation
7. Program for Circular, rectangular pocket milling
8. Program for drilling cycle
9. Program for tool compensation and Program offset
10. NC code generation using CAD software packages
11. Study of cam packages
12. Study of CNC Wire cut EDM

TOTAL: 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can able to perform programming on CNC machine and simulate tool path movement and also able to apply the programming to machine industrial components.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>CNC Lathe / Turning Centre</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CNC Milling Machine / Machining Centre</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To study the functional aspects of different pneumatic and hydraulic components and its usage in circuits.
- To train the students in designing different pneumatic and hydraulic circuits for different application.

LIST OF EXPERIMENTS
1. Study and use of pneumatic and hydraulic elements.
2. Simulation of speed control circuits in a hydraulic trainer.
3. Simulation of hydraulic circuits in a hydraulic trainer.
4. Simulation of single and double acting cylinder circuits using different directional control values.
5. One shot and regenerative pneumatic circuits.
7. Simulation of Electro-pneumatic latch circuits.
8. Simulation of Logic pneumatic circuits.
9. Simulation of electro pneumatic sequencing circuits.
10. Simulation of PLC based electro pneumatic sequencing circuits.
11. Simulation of pneumatic circuits using PLC.

TOTAL: 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can able to select and apply different pneumatics and hydraulic components to design fluid power circuit.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

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<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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<tbody>
<tr>
<td>1</td>
<td>Hydraulic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Electro Hydraulic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>PLC Based Hydraulic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Hydraulic Accumulator Intensifier, Press.</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Transparent Hydraulic &amp; Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Vane Pump Test Rig</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Electro Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>PLC Based Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Gear Pump Test Rig</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES:
To enable learners to,
- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

UNIT I LISTENING AND SPEAKING SKILLS
12
Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries. Listening to lectures, discussions from TV/ Radio/ Podcast.

UNIT II READING AND WRITING SKILLS
12
Reading different genres of tests ranging from newspapers to creative writing. Writing job applications- cover letter- resume- emails- letters- memos- reports. Writing abstracts- summaries- interpreting visual texts.

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS
12
International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service (Language related)- Verbal Ability.

UNIT IV INTERVIEW SKILLS
12
Different types of Interview format- answering questions- offering information- mock interviews-body language( paralinguistic features)- articulation of sounds- intonation.

UNIT V SOFT SKILLS
12
Motivation- emotional intelligence- Multiple intelligences- emotional intelligence- managing changes-time management-stress management-leadership straits-team work- career planning - intercultural communication- creative and critical thinking

Teaching Methods:
1. To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
2. Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
3. Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
4. GD/Interview/Role Play/Debate could be conducted off the laboratory (in a regular classroom) but learners are to be exposed to telephonic interview and video conferencing.
5. Learners are to be assigned to read/write/listen/view materials outside the classroom as well for graining proficiency and better participation in the class.

TOTAL: 60 PERIODS

Lab Infrastructure:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
<th>Qty Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Server</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>• PIV System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
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</tr>
<tr>
<td></td>
<td>• OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
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</tr>
<tr>
<td>2</td>
<td>Client Systems</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Handicam</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Television 46&quot;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Collar mike</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cordless mike</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</td>
<td></td>
</tr>
</tbody>
</table>

**Evaluation:**

**Internal: 20 marks**
- Record maintenance: Students should write a report on a regular basis on the activities conducted, focusing on the details such as the description of the activity, ideas emerged, learning outcomes and so on. At the end of the semester records can be evaluated out of 20 marks.

**External: 80 marks**
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

**Note on Internal and External Evaluation:**
1. Interview – mock interview can be conducted on one-on-one basis.
2. Speaking – example for role play:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephonic conversation- fixing an official appointment / placing an order / enquiring and so on.
3. Presentation – should be extempore on simple topics.
4. Discussion – topics of different kinds; general topics, and case studies.

**OUTCOMES:**
At the end of the course, learners should be able to
- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews.

**REFERENCES:**
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
4. Interactive Multimedia Programs on Managing Time and Stress.
OBJECTIVES:
- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION
Objectives and benefits of planning and control-Functions of production control-Types of production-job- batch and continuous-Product development and design-Marketing aspect - Functional aspects-Operational aspect-Durability and dependability aspect-aesthetic aspect. Profit consideration-Standardization, Simplification & specialization-Break even analysis-Economics of a new design.

UNIT II WORK STUDY
Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study - work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING
Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC
Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS Fundamentals of MRP II and ERP.

OUTCOMES:
TOTAL: 45 PERIODS
Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.

They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

TEXT BOOK:

REFERENCES:

PR6601 COMPUTER AIDED PRODUCT DESIGN

OBJECTIVES:
- To introduce the concepts and applications of CAD
- To introduce the various concepts and techniques used for Product design and to develop product design skills.

UNIT I INTRODUCTION TO COMPUTER AIDED DESIGN
Introduction to Engineering Design – Various phases of systematic design – sequential engineering and concurrent engineering – Computer hardware & Peripherals – software packages for design and drafting.

UNIT II COMPUTER GRAPHICS FUNDAMENTALS

UNIT III GEOMETRIC MODELING

UNIT IV PRODUCT DESIGN CONCEPTS
Product modeling – types of product models; product development process tools – TRIZ – Altshuller’s inventive principles – Modeling of product metrics – Design for reliability – design for manufacturability

UNIT V PRODUCT DATA MANAGEMENT 12

OUTCOMES:
- Upon completion of this course, the students can able to apply geometric modeling principles to design a component and also able to manage the product data and apply product life cycle management to industrial components.

TEXT BOOKS

REFERENCES

PR6602 AUTOMATED PRODUCTION AND COMPUTER INTEGRATED MANUFACTURING L T P C 3 1 0 4

OBJECTIVES:
- To understand the various automated manufacturing activities
- To study the application of computer Technology in the Manufacturing activities
- To know the smooth transition from conventional manufacturing to automated production and computer integrated manufacturing

UNIT I INTRODUCTION 12

UNIT II AUTOMATED PRODUCTION SYSTEMS AND MATERIAL HANDLING AND STORAGE SYSTEM 12
UNIT III GROUP TECHNOLOGY AND CELLULAR MANUFACTURING 12

UNIT IV FLEXIBLE MANUFACTURING SYSTEM 12

UNIT V AUTOMATED ASSEMBLY, COMPUTER PROCESS CONTROL AND SHOP FLOOR CONTROL 12

OUTCOMES:
Upon completion of this course, the students can able to
- Ability to group similar parts
- Ability to design FMS process
- Ability to constituent control that to calculate the amount of script to develop manufacturing plans.
- Ability to combine different concepts to describe computer integrated manufacturing

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

PR6603 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS AND DRAWING L T P C
3 0 0 3

OBJECTIVES:
- To introduce the concepts of various types of jigs, fixtures and dies
- To design and draw jig / fixture/ die for a given component

UNIT I LOCATION AND CLAMPING DEVICES IN JIGS AND FIXUTRES 9

UNIT II DESIGN OF ELEMENTS OF JIGS AND FIXTURE 9
Design concepts of Template Jig, Plate Jig, Sandwich Jig, Vice Jaw Jig, Latch Jig, Turnover jig, Box jig – Fixtures for Milling, Grinding, Turning, Welding, and Assembly – Modular fixtures.

UNIT III PRESS WORKING OPERATION AND FORMING DIES 9
Blanking, Piercing, lancing, notching, bending design features of dies for drawing, extrusion, wire drawing and forging.

UNIT IV ELEMENTS OF DIE 9

UNIT V DESIGN AND DRAWING DIES, JIGS AND FIXTURES 9
Progressive die – compound die – Bending and drawing dies – Drill Jigs – Milling fixtures, turning fixtures.

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
• Upon completion of this course, the students can able to design jigs, fixtures and press tools and drawing.

TEXT BOOKS:

REFERENCES:
3. ASTME, Fundamentals of Tool design, Prentice Hall 1974

PR6611 METAL FORMING LAB AND SPECIAL MACHINES LABORATORY 0 0 4 2

OBJECTIVES:
• To establish hands-on experience in sheet metal forming, bulge forming and Super plastic forming.
• To get hands on experience in machining gear, V-block, dovetail, etc.
• To study tool wear, acceptance test for machine tool

METAL FORMING LAB:
1. Construction Flow Stress – Strain curve
2. Erichsen cupping Test
3. Determination of interface friction factor using ring compression test
4. Construction of FLD of sheet metal
5. Water hammer forming
6. Determination of Power consumption in sheet rolling process
7. Determination of strain rate sensitivity index of given specimen
8. Superplastic forming studies on Pb-Sn alloys
9. Deep drawing
10. Forward Extrusion process
11. Micro-forming
12. Simulation studies on metal forming

SPECIAL MACHINES LAB:
1. Gear Hobbing
   a. Spur Gear
   b. Helical Gear
2. Planning Machine
   a. V-Block
   b. Dove Tail
3. Centreless Cylindrical Grinding
4. Milling Machine
   a. Spur Gear
5. Tool And Cutter Grinding
6. Tool Wear Studies
7. Acceptance Test Of Machine Tool As Per ISI Test Chart
8. EDM
9. Capstan And Turret Lathe
10. Measurement Of Cutting Force

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to perform sheet metal forming, bulge forming and super plastic forming
- Ability to machine raw materials to prepare gear, V-block, etc.,
- Ability to conduct acceptance test for machine tool.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Testing Machine 10T</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Erichsen cupping Tester</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulic Press 50T</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Water hammer forming apparatus</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Two high Rolling mill</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Top open muffle furnace (Max 1200 oC)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Dies for deep drawing</td>
<td>1 SET</td>
</tr>
<tr>
<td>8</td>
<td>Dies for Micro forming</td>
<td>1 SET</td>
</tr>
<tr>
<td>9</td>
<td>Dies for super plastic forming</td>
<td>1 SET</td>
</tr>
<tr>
<td>10</td>
<td>FEM package (ABAQUS, ANSYS...)</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Dies for Constructing FLD of sheet metals</td>
<td>1 SET</td>
</tr>
</tbody>
</table>

PR6612 METROLOGY AND INSPECTION LABORATORY

OBJECTIVES
- To familiar with different measurement equipments and use of this industry for quality inspection

LIST OF EXPERIMENTS
1. Measurements of angle using Sine bar / bevel protractor
2. Measurement of External and internal Taper angle
3. Measurement of Bore Diameter
4. Calibration of Dial gauge
5. Measurement of Roundness
6. Measurements of Screw Thread Parameters using three-wire method
7. Measurements of Surface Roughness
8. Measurements using toolmaker Microscope
9. Measurements using Profile Projector
10. Measurements using Vision Measuring System
11. Measurements using CMM

**TOTAL: 45 PERIODS**

**OUTCOMES**
- Ability to handle different measurement tools and perform measurements in quality impulsion

**LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vernier Calipers 0-150 mm</td>
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<tr>
<td>2</td>
<td>Vernier Calipers 0-300 mm</td>
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</tr>
<tr>
<td>3</td>
<td>Micrometer 0-25 mm</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Micrometer 25-50 mm</td>
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<tr>
<td>5</td>
<td>Micrometer 50-75 mm</td>
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<tr>
<td>6</td>
<td>Dial gauges LC 10micrometer</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Dial gauge L.C. 2micrometer</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>Height gauge Analog</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Height gauge Digital</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Slip gauge set</td>
<td>2 SET</td>
</tr>
<tr>
<td>11</td>
<td>Sine Bar 100 mm</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Sine Bar 200 mm</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Toolmakers microscope</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Profile Projector</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Gear tooth verniers</td>
<td>2</td>
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<tr>
<td>16</td>
<td>Flangernic 0-25</td>
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<tr>
<td>17</td>
<td>Flangemic 25-50</td>
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<td>18</td>
<td>Floating carriage micrometer</td>
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<td>19</td>
<td>Thread plug gauges m24 x 3</td>
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<td>20</td>
<td>Thread plug gauges m20 x 2.5</td>
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<tr>
<td>21</td>
<td>3 wire set box</td>
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<tr>
<td>22</td>
<td>Surface roughness measuring Instrument</td>
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<tr>
<td>23</td>
<td>Precision spheres different dia</td>
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<td>24</td>
<td>Dial Guage Calibrator</td>
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<tr>
<td>25</td>
<td>Precision level</td>
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<tr>
<td>26</td>
<td>Digital Micrometer</td>
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<tr>
<td>27</td>
<td>Digital Vernier 0-150 mm</td>
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<tr>
<td>28</td>
<td>Digital Ht. Guage</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>Bevel Protractor</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>CMM</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>Vision measuring system</td>
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</tr>
<tr>
<td>32</td>
<td>Boreldial gauge 16-35, 35-60</td>
<td>1 BOX</td>
</tr>
<tr>
<td>33</td>
<td>Depth Vernier 0-150mm</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>Depth micrometer with 6 rods</td>
<td>1</td>
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</tbody>
</table>
## OBJECTIVES

- To familiarize the students with test procedures followed in foundry and to practice various types of welding processes.

## LIST OF EXPERIMENTS

### Welding

- Study of different welding equipments and accessories: Gas, Electric Welding Oxy-acetylene gas welding of Lap joint, Butt Joint and T Joint.
- Electric are welding of Lap Joint, Butt Joint, and T Joint.
- Welding of pipes in different positions.
- Brazing practice – furnace brazing.
- Brazing welding of cast iron.
- Thermit welding of thick material like rod plates etc.

### Foundry

- Preparation of green moulding sand using a 5 kg muller and testing for Compression, shear, tensile, transverse strengths, hardness in green condition:
- ii. in dry condition after drying in oven at 150°C for one and half hour.
- Permeability testing.
- Determining the clay content.
- Sieve analysis of dry silica sand.
- Determining the moisture content by various methods.
- Melting any non-ferrous metal and making simple castings - Demonstration.

## OUTCOMES:

- Ability to perform different welding operations to form the metals
- Ability to carryout the foundry practices and perform different test required to characteristic transfer materials.

## LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 Kg Muller</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Sand rammer</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Weighing balance</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Universal sand strength testing with all accessories</td>
<td>1 SET</td>
</tr>
<tr>
<td>5</td>
<td>Permeability tester</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Quick moisture tester</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Infra-red drier</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Sieve shaker with Sieves</td>
<td>1 SET</td>
</tr>
<tr>
<td>9</td>
<td>Crucible furnace</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Oxy acetylene gas welding equipment</td>
<td>1 SET</td>
</tr>
</tbody>
</table>

TOTAL: 60 PERIODS
GE6757  TOTAL QUALITY MANAGEMENT  L  T  P  C
3 0 0 3

OBJECTIVES:
- To facilitate the understanding of Quality Management principles and process.

UNIT I  INTRODUCTION  9

UNIT II  TQM PRINCIPLES  9
Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III  TQM TOOLS AND 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 AND TECHNIQUES II  9

UNIT V  QUALITY SYSTEMS  9

OUTCOMES:
- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

REFERENCES:
OBJECTIVES:
• To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I  INTRODUCTION

UNIT II  8085 MICROPROCESSOR AND 8051 MICROCONTROLLER

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV PROGRAMMABLE LOGIC CONTROLLER
Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC.

UNIT V ACTUATORS AND MECATRONIC SYSTEM DESIGN

OUTCOMES:
• Upon completion of this course, the Students can able to design mechatronics system with the help of Microprocessor, PLC and other electrical and Electronics Circuits.

TEXT BOOKS:

REFERENCES:
PR6701 FINITE ELEMENT ANALYSIS IN MANUFACTURING  
3 0 0 3
ENGINEERING

OBJECTIVES:

- To introduce the concept of FEM and to apply in the field of Manufacturing Engineering

UNIT I INTRODUCTION


UNIT II GENERAL PROCEDURE OF FET

Discretization of Domain selection of interpolation polynomials-Convergence requirements-Formulation of element characteristics matrices and load vectors – Assembly of element characteristics matrices-Solution of finite element equations-Post processing of results.

UNIT III FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS

One dimensional finite element analysis-Linear bar element-Quadratic bar element-Beam element-Frame elements-One dimensional heat transfer-Two dimensional finite element analysis approximation of geometry and field variables-Three nodded triangular element- Four nodded rectangular element-Six nodded triangular element-Natural coordinates and coordinate transformation – Numerical integration-Incorporation of boundary conditions

UNIT IV ISO-PARAMETRIC ELEMENTS

Iso-parametric elements-Dynamic analysis-Equations of motion using Lagrange’s approach-Consistent and Lumped mass matrices-Formulation of FE equations for vibration problems-Solution of Eigen value problems-Transient vibration analysis-Thermal transients.

UNIT V APPLICATION OF FINITE ELEMENT ANALYSIS


TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the Students can able to
- Develop element stiffness matrix equation from spring elements
- Assemble element matrix equation in to a global matrix
- Enforce boundary condition and forces on the system.
- Solve the resulting system and interpret result.
- Develop the concept of local, global coordinate system and their transformation.

TEXT BOOKS:

REFERENCES:

ME6010 ROBOTICS

OBJECTIVES:
- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification-Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS
Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

**OUTCOMES:**
- Upon completion of this course, the students can apply the basic engineering knowledge for the design of robotics

**TEXT BOOKS:**

**REFERENCES:**

**MF6711 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY**

**OBJECTIVES:**
- To give exposure to software tools needed to analyze engineering problems.
- To expose the students to different applications of simulation and analysis tools.

**LIST OF EXPERIMENTS:**

**A. SIMULATION**
1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration
3. Mechanism Simulation using software

**B. ANALYSIS**
1. Force and Stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of plates.
7. Vibration analysis of spring-mass systems.
8. Model analysis of Beams.
9. Harmonic, transient and spectrum analysis of simple systems.

**OUTCOME**
• To train the students to make use of software for simulation and analysis for various applications in the field of manufacturing engineering.

TEXT BOOKS:

EQUIPMENTS FOR A BATCH OF 30 STUDENTS

PR6711 MICROPROCESSOR AND MECHATRONICS LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
• To expose the students to use the microprocessor to perform simple operations / Programming
• To design and develop hydraulic pneumatic and electrical circuits using simulating systems
• To study the characteristic of different hydraulic, pneumatic and electrical components.

MICROPROCESSOR LABORATORY
LIST OF EXPERIMENTS
1. Addition and subtraction of two 16-bit numbers
2. Sorting a series of numbers in Ascending and Descending order
3. Conversion of Binary number to BCD
4. Conversion of BCD to Binary
5. Implementation of Block-Data transfer
6. Controlling stepper motor using Microprocessor
7. Verification of Logic gates
8. Design of adders and subtractors
9. Multiplexer and Demultiplexer
10. Applications of an OPAMP
11. Characteristics of common emitter transistor
12. Transfer and Drain Characteristics of FET amplifier

MECHATRONICS LABORATORY
LIST OF EXPERIMENTS
1. Design and testing of fluid power circuits to control
   (i) Velocity (ii) direction and (iii) force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC
5. Speed Control of AC & DC drives
6. Servo controller interfacing for DC motor
7. PID controller interfacing
8. Stepper motor interfacing with 8051 Micro controller
   (i) full step resolution (ii) half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems Using appropriate softwares
11. Computerized data logging system with control for process variables like pressure, flow and temperature.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use the microprocessor to perform simple programme
- Ability to use microprocessor, PID controller for interface
- Ability to perform testing on fluid power inverter
- Ability to simulate circuits using hydraulic, Pneumatic and electrical components.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic Pneumatic Trainer Kit with manual and electrical controls/PLC Control</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Basic Hydraulic Trainer Kit</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulics and Pneumatics Systems Simulation Softwares</td>
<td>10 SET</td>
</tr>
<tr>
<td>4</td>
<td>8051 - Microcontroller kit with stepper motor and drive circuit</td>
<td>2 SET</td>
</tr>
<tr>
<td>5</td>
<td>Simulation Softwares and Sensors to measure Pressure, Flow rate, direction, speed, velocity and force</td>
<td>2 SET</td>
</tr>
</tbody>
</table>

PR6712 DESIGN AND FABRICATION PROJECT

OBJECTIVES:
- The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

GUIDELINE FOR REVIEW AND EVALUATION
The students may be grouped into 2 to 4 and work under a project supervisor. The device/system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL : 60 PERIODS

OUTCOMES:
- Use of design principles and develop conceptual and engineering design of any components.
- Ability to fabricate any components using different manufacturing tools.

ME6005 PROCESS PLANNING AND COST ESTIMATION

OBJECTIVES:
- To introduce the process planning concepts to make cost estimation for various products after process planning
UNIT I  INTRODUCTION TO PROCESS PLANNING  10
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in
process selection-.Production equipment and tooling selection

UNIT II  PROCESS PLANNING ACTIVITIES  10
Process parameters calculation for various production processes-Selection jigs and fixtures election
of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III  INTRODUCTION TO COST ESTIMATION  8
Importance of costing and estimation –methods of costing-elements of cost estimation –Types of
estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head
charges- Calculation of depreciation cost

UNIT IV  PRODUCTION COST ESTIMATION  8
Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop,
Estimation of Foundry Shop

UNIT V  MACHINING TIME CALCULATION  9
Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining
Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling,
Shaping and Planning -Machining Time Calculation for Grinding

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to use the concepts of process planning
and cost estimation for various products.

TEXT BOOKS:
1. Peter scalon, “Process planning, Design / Manufacture interface”, Elsevier science technology

REFERENCES:
1998.
PR6811  COMPREHENSION  L  T  P  C
0 0 2 1

OBJECTIVES:
• To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

METHOD OF EVALUATION:
The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

TOTAL : 30 PERIODS

OUTCOMES:
• ability to understand and comprehend any given problem related to mechanical engineering field.

PR6812  PROJECT WORK  L  T  P  C
0 0 12 6

OBJECTIVES:
• To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOMES:
• On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

ME6004  UNCONVENTIONAL MACHINING PROCESSES  L  T  P  C
3 0 0 3

OBJECTIVES:
• To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I  INTRODUCTION  6
UNIT II MECHANICAL ENERGY BASED PROCESSES 9

UNIT III ELECTRICAL ENERGY BASED PROCESSES 9

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 11

UNIT V THERMAL ENERGY BASED PROCESSES 10
Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to demonstrate different unconventional machining processes and know the influence of difference process parameters on the performance and their applications

TEXT BOOKS:

REFERENCES:

MF6503 PRECISION ENGINEERING

OBJECTIVES:
• To impart knowledge in the increasing quality concepts of parts, accuracy requirement of machine tools and also to introduce latest topics in Manufacturing like micro machining and smart materials so as to equip them to join core electronic manufacturing industries.

UNIT I CONCEPTS OF ACCURACY AND MACHINE TOOLS 9
UNIT II  STIFFNESS, THERMAL EFFECTS AND FINISH MACHINING  12
Overall stiffness of Lathe – compliance of work piece – errors caused by cutting forces – deformation
Surface roughness.

UNIT III  DIMENSIONING  6
Definition of terms – Key dimension – Superfluous dimension – dimensional stepped shaft – assigning
tolerances in the constituent dimensions – dimensional chains.

UNIT IV  MICRO-MACHINING MICRO FABRICATION  9
Micro Machining – Photo resist process – Lithography – LIGA Process – Optical, processing of
materials – electron beam machining – beam machining – micro forming, diamond turning – micro
positioning devices – etching – physical vapour deposition – Chemical vapour deposition

UNIT V  SMART STRUCTURES, MATERIALS AND MICRO ACTUATORS  9
Smart structures – Smart materials types and applications - smart sensors – micro valves – MEMS –

OUTCOMES
• Upon completion of this course the student can able to use of quality concepts parts, accuracy
requirements of machine tools and use of latest machining process such as micro machining and
micro fabrication.

TEXT BOOKS:

REFERENCES:
University Press, 1996.

PR6001  SURFACE ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:
• To study the surface preparation techniques
• To import knowledge on thermal spraying process and electrodeposited coating
• To study the process of Hot dip and diffusion coating
• To induce the testing procedure for surface coating

UNIT I  METAL CLEANING AND PREVIEW ON SURFACE ENGINEERING  8
Need and relevance of surface engineering – pre-treatment of coating, General cleaning process for
ferrous and non-ferrous metals and alloys – selection of cleaning process – alkaline cleaning –
emulsion cleaning- ultrasonic cleaning – acid and pickling salt bath descaling – abrasive bath cleaning
UNIT II THERMAL SPRAYING PROCESSES AND ELECTRODEPOSITED COATINGS

UNIT III HOT DIP COATING AND DIFFUSION COATINGS

UNIT IV NON-METALLIC COATING OXIDE AND COVENSION COATINGS

UNIT V QUALITY ASSURANCE, TESTING AND SELECTION OF COATINGS

TOTAL: 45 PERIODS

OUTCOMES:
- Explain the important of surface engineering to industries
- Use of thermal spray for coating
- Explain the process and mechanism of different diffusion coating process
- Explain the methods of non metallic coating
- Explain the testing procedure for quality assurance.

TEXT BOOKS:

REFERENCES:

ME6015 OPERATIONS RESEARCH

OBJECTIVES:
- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.
UNIT I  
LINEAR MODELS

UNIT II  
TRANSPORTATION MODELS AND NETWORK MODELS

UNIT III  
INVENTORY MODELS
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV  
QUEUEING MODELS
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V  
DECISION MODELS

OUTCOMES:
• Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

REFERENCES:

GE6083  
DISASTER MANAGEMENT
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 stake-holders- Institutional Processess 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.

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.

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

MG6072 MARKETING MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
- To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I MARKETING PROCESS 9
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic - Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

TOTAL: 45 PERIODS

OUTCOME:
- The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To impact knowledge on fuzzy logic principles
- To understand models of ANN
- To use the fuzzy logic and neural network for application related to design and manufacture

UNIT I  INTRODUCTION TO FUZZY LOGIC PRINCIPLES 
9

UNIT II  ADVANCED FUZZY LOGIC APPLICATIONS
9

UNIT III  INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS
9

UNIT IV  OTHER ANN ARCHITECTURES
9

UNIT V  RECENT ADVANCES
9

TOTAL: 45 PERIODS

OUTCOMES:

- Develop the skill in basic understanding on fuzzy and neural network
- Explore the functional components of neural classification conducer and the functional components of fuzzy logic classification on controller.
- Develop and implement a basic trainable neural network (or) a fuzzy logic system to design and manufacturing.

TEXT BOOKS:


REFERENCES:

PR6003 INSTRUMENTATION AND CONTROL

OBJECTIVES:
- To understand the principle of measuring displacement, velocity, acceleration, vibration, force, stress and strain
- To build mathematical model for control system.
- To familiar with bode plots.

UNIT I INTRODUCTION
Static and dynamic characteristics of measurement systems, standards and calibration, error and uncertainty analysis, statistical analysis of data, and curve fitting.

UNIT II MECHANICAL MEASUREMENTS AND INDUSTRIAL INSTRUMENTATION
Measurement of displacement, velocity (linear and rotational), acceleration, shock, vibration, force torque power, strain, stress, pressure temperature.

UNIT III DATA DISPLAY AND RECORDING DEVICES
Data display-CRO,LED, LCD, magnetic tape recorders, x-y recorders, UV recorders, Oscilloscope recorders, digital printers and data loggers.

UNIT IV CONTROL
Introduction to control systems, mathematical model of physical systems in transfer function and state space forms, response of dynamic systems, concept of pole and zero of a system, realization of transfer functions.

UNIT V STABILITY ANALYSIS
Stability criteria bode plots, routh and Nyquist criteria.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course student can able to perform measurement of displacement, velocity, force, torque, strain, stress, pressure and temperature.

TEXT BOOKS:

REFERENCES:

GE6081 FUNDAMENTALS OF NANOSCIENCE 

L T P C 3 0 0 3 

OBJECTIVES

- To learn about basis of nanomaterial science, preparation method, types and application

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 GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMB.

UNIT III NANOMATERIALS
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications

UNIT IV CHARACTERIZATION 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

UNIT V APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS

REFERENCES

GE6084 HUMAN RIGHTS L T P C
3 0 0 3

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:

PR6004 DESIGN OF MACHINE TOOL STRUCTURE L T P C
3 0 0 3

OBJECTIVES:
• To understand different machine tools used for machining.
• To understand the design criteria for machine tool structures.
• To know the designing of slideways
• To understand the vibration in the machine tool during operation.

UNIT I INTRODUCTION

UNIT II STRENGTH AND RIGIDITY OF MACHINE TOOL STRUCTURES

UNIT III SLIDEWAYS

UNIT IV SPINDLES AND SPINDLE SUPPORTS

UNIT V MACHINE TOOL DYNAMICS

TOTAL: 45 PERIODS

OUTCOMES
• Ability to design strength and components of machine tools.

TEXT BOOKS:

REFERENCES:

ME6007 COMPOSITE MATERIALS AND MECHANICS

OBJECTIVES:
• To understand the fundamentals of composite material strength and its mechanical behavior
• Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
• Thermo-mechanical behavior and study of residual stresses in Laminates during processing. Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING 12

UNIT II FLAT PLATE LAMINATE CONSTITUTE EQUATIONS 10

UNIT III LAMINA STRENGTH ANALYSIS 5

UNIT IV THERMAL ANALYSIS 8

UNIT V ANALYSIS OF LAMINATED FLAT PLATES 10

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to analyse the fiber reinforced Laminate for optimum design
• Apply classical laminate theory to study and analyse the residual stresses in Laminate.

TEXT BOOKS:

REFERENCES:
PR6005 PROCESSING OF POLYMER AND COMPOSITES

OBJECTIVES
To understand the characteristics of different reinforcement matrix materials
- To develop composite materials for different application.
- To know the different process used for polymer matrix composites, metal matrix composites and ceramics matrix composites

UNIT I INTRODUCTION
Classification of polymers - properties and applications of selective engineering polymers - fundamentals of composites - need for composites - enhancement of properties - classification of composites - matrix polymer matrix composites (PMC), metal matrix composites (MMC), Ceramic matrix composites (CMC) reinforcement - particle reinforced composites, fibre reinforced composites, applications of various types of composites.

UNIT II POLYMER MATRIX COMPOSITES
Polymer matrix resins - thermosetting resins, thermoplastic resins - reinforcement fibres - rovings - woven fabrics - non woven random mats - various types of fibres, PMC processes - hand lay up processes - spray lay up processes - compression moulding - reinforced reaction injection moulding - resin transfer moulding - pultrusion - filament winding - injection moulding fibre reinforced plastics (FRP) (Glass fibre reinforced plastics (GRP)).

UNIT III METAL MATRIX COMPOSITES

UNIT IV CERAMICS MATRIX COMPOSITES

UNIT V ADVANCES IN POLYMERS & COMPOSITES

TOTAL: 45 PERIODS

OUTCOMES
- Ability to select suitable matrix, reinforce materials for polymer matrix composites, metal matrix composites and ceramics matrix composites

TEXT BOOKS:

REFERENCES:
5. Brydson, Hand book of plastic processing

PR6006 NON DESTRUCTIVE TESTING METHODS L T P C
3 0 0 3

OBJECTIVES :
- To understand principle behind various NDT techniques.
- To study about NDT equipments and accessories.
- To learn working procedures of various NDT techniques.

UNIT I NON-DESTRUCTIVE TESTING: AN INTRODUCTION 6
Introduction to various non-destructive methods- Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications.

UNIT II LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING 10
Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods – Applications Principle of MPT, Magnetising technical and procedure used for testing a component , Equipment used for MPT , Applications.

UNIT III EDDY CURRENT TESTING AND ACOUSTIC EMISSION TESTING 10

UNIT IV ULTRASONIC TESTING 10
Principle, Ultrasonic transducers, Inspection Methods – Normal Incident Pulse-echo Inspection, Through - transmission Testing, angle Beam Pulse-echo testing, Techniques for Normal Beam Inspection, Ultrasonic Flaw detection Equipment, Modes of display – Ascan, B-Scan & C-Scan-Applications

UNIT V RADIOGRAPHY, COMPARISON AND SELECTION OF NDT METHODS 9
Basic principle, Effect of radiation on Film, Radiographic imaging – Inspection Techniques – Single wall single image, Double wall Penetration & Multiwall Penetration technique – Comparison and selection of various NDT techniques.

TOTAL: 45 PERIODS

OUTCOMES
- Ability to detect the flow and other defects using non destructive testing procedure for industrial component.
PR6007 SIMULATION OF MANUFACTURING SYSTEMS

OBJECTIVES:
- To introduce the concepts of simulation and to apply them for manufacturing systems.

UNIT I INTRODUCTION

UNIT II RANDOM NUMBERS

UNIT III DESIGN OF SIMULATION EXPERIMENTS

UNIT IV SIMULATION LANGUAGE
Study of GPSS (Basic blocks only) Generate, Queue, Depart, Size, Release, Advance, Terminate, Transfer, Enter and Leave.

UNIT V CASE STUDIES
Development of simulation models using GPSS for queuing, production, inventory, maintenance and replacement systems, (Students may be asked to prepare and present the case studies)

OUTCOMES
- Use of concepts of simulation to the manufacturing systems.

TEXT BOOK:
REFERENCES:

PR6008 MACHINE VISION

OBJECTIVES:
• To understand the principle, importance and application of machine vision system in Manufacturing and measurement.

UNIT I INTRODUCTION TO MACHINE VISION
Machine Vision use of machine vision – tasks for a vision system – relation to other fields – place of vision in CIM.

UNIT II IMAGE ACQUISITION AND CONVERSION

UNIT III IMAGE PROCESSING DECISION MAKING
Processing of binary images – thresholding, geometrical properties, topological properties – processing of gray scale images statistical operations, spatial operations, segmentation edge detection, morphological operations – image analysis – factors extraction – decision making.

UNIT IV PATTERN RECOGNITION

UNIT V MACHINE VISION APPLICATIONS
Applications in user industries automotive, semiconductor, electronic manufacturing, printing industries etc. – generic applications founding manufacturing metrology, inspection assembly verification – application analysis and implementation.

OUTCOMES
• Use of machine vision techniques to pattern recognizing.
• Use of machine vision in manufacturing industries in process implementation, assembly.

TEXTBOOK

REFERENCES:
1. Richard O.Duda, Peter E. Hurt, Pattern Classification and Scene Analysis Publisher, 1973
2. Rafael C. Gonzaiexes, Richard E. Woods, Digital Image processing publisher, 1992
PR6009 PRODUCTION MANAGEMENT

OBJECTIVES
- To study the evolution of Management
- To study the functions and Production management
- To learn the application of the principles in an organization

UNIT I PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT

UNIT II INVENTORY MANAGEMENT
Purpose of Inventory – Cost related to inventors – Basic EOQ model – variations in EOQ model – Finite Production quality discounts – ABC Analysis – MRP Analysis.

UNIT III OPERATIONS MANAGEMENT

UNIT IV FINANCIAL MANAGEMENT

UNIT V MARKETING MANAGEMENT

OUTCOMES
- Ability to use inventory Management, Operation Management, Financial Management, Manufacturing Management and Industrial Development.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the concepts of man machine systems and techniques of providing human comfort in man-making work systems.

UNIT I INTRODUCTION

UNIT II WORK SPACE DESIGN
Anthropometry – workspace design for standing and seatedworkers – Arrangements of components within a physical space – Interpersonal aspect of workplace design.

UNIT III DESIGN OF EQUIPMENT
Programme factors to be considered, design of displays and controls – design for maintainability – heat stresses – manual lifting.

UNIT IV DESIGN FOR ENVIRONMENT

UNIT V RECENT ADVANCES AND TRENDS
Legislative trends – Trends in work system design – occupational diseases – Application of Ergonomics in automobiles.

TOTAL: 45 PERIODS

OUTCOMES

- Use the concept of ergonomics design in equipment
- Perform work space design considering physical space and inter personal space.

TEXT BOOK:

REFERENCES:

OBJECTIVES:

- To enable students to understand and interpret the basic financial statements, to comprehend the basics in managing finance and to know pricing mechanism.
UNIT I INTRODUCTION

UNIT II FINANCIAL ACCOUNTING

UNIT III PROFIT VALUE ANALYSIS
Cost volume profit analysis – relevant costs in decision making profit management analysis – break even analysis – margin of safety, Angle of incidence & multi product break even analysis.

UNIT IV WORKING CAPITAL MANAGEMENT

UNIT V CAPITAL BUDGETING
Significance of capital budgeting – payback period – present value method – Accounting rate of return method, Internal Rate of Return.

TOTAL: 45 PERIODS

OUTCOME:
• Upon successful completion of this course, students will get the ability to prepare and interpret financial statements, manage funds efficiently and fix and revise prices as warranted.

TEXTBOOKS:

REFERENCES:

PR6011 PURCHASING AND MATERIALS MANAGEMENT

OBJECTIVES
• To impact knowledge on general structure of material management
• To understand the general procedure and structures of purchase management
• To understand and train the students in materials planning and solve forecasting related problems
• To understand inventory management and to study different models

UNIT I FUNCTIONS OF MATERIALS MANAGEMENT
Introduction to materials management – objectives – Organization – Functions – Operating Cycle – Value analysis – Make or buy decisions.
UNIT II  PURCHASING MANAGEMENT  8
Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations - Insurance and claims managements

UNIT III  STORES MANAGEMENT  8

UNIT IV  MATERIALS PLANNING  12
Forecasting - ABC analysis – Materials requirements planning - Inventory systems – Quantity – periodic – Deterministic models – Aggregate planning – JIT.

UNIT V  INVENTORY MANAGEMENT  11

TOTAL: 45 PERIODS

OUTCOMES
- To explain the functions and structure of materials, purchase and store management
- To perform analysis on materials planning
- To perform calculation using different inventory models.

TEXT BOOK:

REFERENCES:

PR6012  ADVANCES IN OPERATION RESEARCH  L T P C
3 0 0 3

OBJECTIVES:
- To introduce the advanced OR models and to apply them for Engineering problems.

UNIT I  INTRODUCTION  5

UNIT II  CLASSIC OPTIMIZATION TECHNIQUES  10

UNIT III  NON-LINEAR PROGRAMMING  9
UNIT IV  INTEGER PROGRAMMING  

UNIT V  DYNAMIC PROGRAMMING  
Formulation – Application to capital budgeting, reliability improvement, shortest path, solution of LP using DP.

TOTAL: 45 PERIODS

OUTCOMES
• Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOKS:

REFERENCES:

IE6603  RELIABILITY ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:
• To stress the importance of reliability in Engineering and products also the concept of maintainability, failure modes and testing methods.

UNIT I  CONCEPTS OF RELIABILITY, SYSTEM AND MODELS  12

UNIT II  DESIGN FOR RELIABILITY AND MAINTAINABILITY  12

UNIT III  OPTIMIZATION OF SYSTEM RELIABILITY  7
Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming.

UNIT IV  THE ANALYSIS OF FAILURE DATA AND RELIABILITY TESTING  7

UNIT V  PACKAGING AND TRANSPORTATION FOR RELIABILITY  7

TOTAL: 45 PERIODS

OUTCOMES
• The Student must apply and optimize reliability for time independent and time dependent failure models through various testing methods for various manufacturing amnesty process

TEXT BOOKS:

REFERENCES:

PR6013  MACHINE TOOL CONTROL AND CONDITION MONITORING  L T P C
3 0 0 3

OBJECTIVES:
• To understand the control system of machine tools and its applications
• To understand the objectives, aims and methodology of machine tool condition onitoring and diagnostics.

UNIT I  OVERVIEW OF AUTOMATIC CONTROLS IN MACHINE TOOLS  6
Open loop – closed loop system – block diagram representation of machine tool control systems.
UNIT II  COMPUTER CONTROL SYSTEM  15
Process computer-peripherals – Data logger-Direct digital control-Supervisory computer control-
Adaptive control-types-adaptive control for turning, milling, grinding and EDMProgrammable logic controller-Functions-applications in machine tools.

UNIT III  DRIVE SYSTEMS IN MACHINE TOOLS  8
Electrical, hydraulic and pneumatic types – servo motor-stepper motor-ball screw mechanism. Feed
back devices-Syncro, resolver, diffraction gratings, potentiometer, and inductosyn-encoders-
application in machine tools.

UNIT IV  CONDITION MONITORING  8
Condition monitoring techniques – Visual, temperature, vibration, lubricant, thickness, noise and
sound. Condition monitoring of machine tools.

UNIT V  MACHINE TOOL DIAGNOSTICS  8
Objectives-aims-examples of monitoring and diagnosis-control structures for machine diagnosis-
utilization of diagnostic results.

TOTAL: 45 PERIODS

OUTCOMES
• Ability to use different techniques to monitor the machine tool to prevent from failures.

TEXTBOOK

REFERENCES:
1. Sushil Kumar Srivstava “ Industrial maintenance management” S.Chand & company ltd., New
 Delhi, 1998.

PR6014 MINI PROJECT  L T P C
0 0 6 3

OBJECTIVES:
1. The students in batches (not exceeding three in a batch) have to take up a project in the area
of manufacturing engineering.
2. Each batch is guided by a faculty member. The students have to select a suitable problems,
design, prepare the drawings, produce the components, assemble and commission the
project.
3. The students have to prepare and present a detailed project report at the end of the VIII
semester.
4. The evaluation will ne made for the continuous internal assessment for the Project by a
committee nominated by the Head of the Department.
OBJECTIVES:
• To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

UNIT II ENGINEERING ETHICS 9

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

UNIT V GLOBAL ISSUES 8

TOTAL: 45 PERIODS

OUTCOME:
• Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXTBOOKS:

REFERENCES:
MG6071 ENTERPRISE DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:
• To develop and strengthen entrepreneurial quality and motivation in students and to impart basic
entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP 9
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur
Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 9
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business
Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project
Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business
opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of
Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs
and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of

UNIT V SUPPORT TO ENTREPRENEURS 9
Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures
- Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small
industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of the course, students will be able to gain knowledge and skills needed to run a
business successfully.

TEXTBOOKS:
Learning 2014.

REFERENCES:
ME6012 MAINTENANCE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:
- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
- To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE
Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING
Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS
Repair methods for beds, slideways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT
Repair methods for Material handling equipment - Equipment records –Job order systems -Use of computers in maintenance.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the programme, the students can able to implement the maintenance function and different practices in industries for the successful management of maintenance activities
- To identify the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.

TEXT BOOKS:
REFERENCES: