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### ELECTIVES FOR B.E. MECHANICAL ENGINEERING

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#### SEMESTER VII

**Elective II**

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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 - Listening 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 9+3

UNIT II SEQUENCES AND SERIES 9+3
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:
UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS 9
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 9

UNIT IV ACOUSTICS AND ULTRASONICS 9
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 9
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  9
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  9
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 isochoire (problems).

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  9

UNIT IV  PHASE RULE AND ALLOYS  9

UNIT V  NANOCHEMISTRY  9
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

TOTAL :45 PERIODS

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
L T P C
3 0 0 3

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

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
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
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

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**GE6161**  
**COMPUTER PRACTICES LABORATORY**

**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
   (f) Jigsaw 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

GE6163            PHYSICS AND CHEMISTRY LABORATORY – I             L T P C
                   0 0 2 1

PHYSICS LABORATORY – I

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.

TOTAL: 30 PERIODS

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

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (each 30 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 - 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
9+3
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – 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.

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

**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 parallelepipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS
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

UNIT IV ANALYTIC FUNCTIONS
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, z², e^z and bilinear transformation.

UNIT V COMPLEX INTEGRATION
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 9

UNIT II SEMICONDUCTING MATERIALS 9

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9
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 9

UNIT V ADVANCED ENGINEERING MATERIALS 9

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 - refactoriness 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 L T P C 4 0 0 4

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 12
Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12
UNIT IV  DIGITAL ELECTRONICS  12
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING  12
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

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 –

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 BaCl₂ and Na₂SO₄

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:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Potentiometer</td>
<td>5 Nos</td>
</tr>
<tr>
<td>2. Flame photo meter</td>
<td>5 Nos</td>
</tr>
<tr>
<td>3. Weighing Balance</td>
<td>5 Nos</td>
</tr>
<tr>
<td>4. Conductivity meter</td>
<td>5 Nos</td>
</tr>
</tbody>
</table>

Common Apparatus: Pipette, Burette, conical flask, percelain tile, dropper (30 Nos each)
MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

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

CE6306 STRENGTH OF MATERIALS

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 – Lame’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:

ME6301 ENGINEERING THERMODYNAMICS

OBJECTIVES:
- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW

UNIT II SECOND LAW AND AVAILABILITY ANALYSIS

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE
UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS

UNIT V GAS MIXTURES AND PSYCHROMETRY
Mole and Mass fraction, Dalton’s and Amagat’s Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.
• Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

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  8

UNIT III  DIMENSIONAL ANALYSIS  9
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV  PUMPS  10

UNIT V  TURBINES  10

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:

ME6302  MANUFACTURING TECHNOLOGY – I  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I  METAL CASTING PROCESSES  9
Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO2 process – Stir casting; Defects in Sand casting
UNIT II JOINING PROCESSES

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

UNIT III METAL FORMING PROCESSES


UNIT IV SHEET METAL PROCESSES


UNIT V MANUFACTURE OF PLASTIC COMPONENTS


TOTAL: 45 PERIODS

OUTCOMES:

• Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production

TEXT BOOKS:


REFERENCES:

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
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
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
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
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
ME6311 MANUFACTURING TECHNOLOGY LABORATORY – I

OBJECTIVES:
- To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

LIST OF EXPERIMENTS
Machining and Machining time estimations for:
1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to demonstrate and fabricate different types of components using the machine tools

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>
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<tbody>
<tr>
<td>1</td>
<td>Centre Lathes</td>
<td>7 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Shaper</td>
<td>1 Nos.</td>
</tr>
</tbody>
</table>

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/submersible 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

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>
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<tbody>
<tr>
<td>1</td>
<td>Orifice meter setup</td>
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<tr>
<td>2</td>
<td>Venturi meter setup</td>
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</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 setup</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>
<tr>
<td>8</td>
<td>Pelton wheel setup</td>
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</tr>
<tr>
<td>9</td>
<td>Francis turbine setup</td>
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<tr>
<td>10</td>
<td>Kaplan turbine setup</td>
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</tbody>
</table>

EE6365 ELECTRICAL ENGINEERING LABORATORY

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

TOTAL: 45 PERIODS

OUTCOMES
- Ability to perform speed characteristic of different electrical machine

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>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>
</tbody>
</table>
MA6452   STATISTICS AND NUMERICAL METHODS   L T P C
                                                                 3 1 0 4

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

UNIT I   TESTING OF HYPOTHESIS   9+3
Large sample test based on Normal distribution for single mean and difference of means - Tests
based on t, $\chi^2$ and F distributions for testing means and variances – Contingency table (Test for
Independency) – Goodness of fit.

UNIT II   DESIGN OF EXPERIMENTS   9+3
One way and two way classifications - Completely randomized design – Randomized block design –
Latin square design - $2^2$ factorial design.

UNIT III   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9+3
values of a matrix by power method.

UNIT IV   INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL
INTEGRATION   9+3
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward
difference interpolation – Approximation of derivates using interpolation polynomials – Numerical
single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   9+3
Taylor’s series method – Euler’s method – Modified Euler’s method – Fourth order Runge-Kutta
method for solving first order equations – Milne’s predictor corrector methods for solving first order
equations – Finite difference methods for solving second order equations.

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

OUTCOMES
- It helps the students to have a clear perception of the power of statistical and 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

ME6401 KINEMATICS OF MACHINERY

OBJECTIVES:
• To understand the basic components and layout of linkages in the assembly of a system / machine.
• To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
• To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
• To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

UNIT I BASICS OF MECHANISMS

UNIT II KINEMATICS OF LINKAGE MECHANISMS

UNIT III KINEMATICS OF CAM MECHANISMS

UNIT IV GEARS AND GEAR TRAINS
UNIT V  FRICTION IN MACHINE ELEMENTS
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply fundamentals of mechanism for the design of new mechanisms and analyse them for optimum design.

TEXT BOOKS:

REFERENCES:

ME6402 MANUFACTURING TECHNOLOGY – II

OBJECTIVES:
- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming

UNIT I  THEORY OF METAL CUTTING
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II  TURNING MACHINES
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle:
UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES

UNIT IV ABRASIVE PROCESS AND BROACHING
Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V CNC MACHINING
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools and also demonstrate the programming in CNC machining.

TEXT BOOKS:

REFERENCES:

ME6403 ENGINEERING MATERIALS AND METALLURGY

OBJECTIVES:
• To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I ALLOYS AND PHASE DIAGRAMS

UNIT II HEAT TREATMENT
Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T.

UNIT III  FERROUS AND NON-FERROUS METALS  9

UNIT IV  NON-METALLIC MATERIALS  9
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAl, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al₂O₃, SiC, Si₃N₄, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT V  MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS  8

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the different materials, their processing, heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:

REFERENCES:

GE6351  ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C
3 0 0 3

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 12
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
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear
accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products –
The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of
labeling of environmentally friendly products (Ecomark). enforcement machinery involved in
environmental legislation- central and state pollution control boards- disaster management: floods,
earthquake, cyclone and landslides. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6
Population growth, variation among nations – population explosion – family welfare programme –
welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in
environment and human health – Case studies.

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.
• 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 :
1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition,

REFERENCES :
1. Trivedi.R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House,
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi,
2007.

ME6404 THERMAL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• To integrate the concepts, laws and methodologies from the first course in thermodynamics
into analysis of cyclic processes
• To apply the thermodynamic concepts into various thermal application like IC engines, Steam
Turbines, Compressors and Refrigeration and Air conditioning systems

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric
chart permitted)
UNIT I       GAS POWER CYCLES  8
Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure, and air standard efficiency  
- Comparison of cycles.

UNIT II       INTERNAL COMBUSTION ENGINES  10
Classification - Components and their function. Valve timing diagram and port timing diagram - actual  
and theoretical p-V diagram of four stroke and two stroke engines. Simple and complete Carburettor.  
MPFI, Diesel pump and injector system. Battery and Magneto Ignition System - Principles of  
Combustion and knocking in SI and CI Engines. Lubrication and Cooling systems. Performance  
calculation.

UNIT III      STEAM NOZZLES AND TURBINES  9
Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio,  
supersaturated flow. Impulse and Reaction principles, compounding, velocity diagram for simple and  
multi-stage turbines, speed regulations –Governors.

UNIT IV      AIR COMPRESSOR  9
Classification and working principle of various types of compressors, work of compression with and  
without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of  
reciprocating compressors, Multistage air compressor and inter cooling –work of multistage air  
compressor

UNIT V      REFRIGERATION AND AIR CONDITIONING  9
Refrigerants - Vapour compression refrigeration cycle- super heat, sub cooling – Performance  
calculations - working principle of vapour absorption system, Ammonia –Water, Lithium bromide –  
water systems (Description only) . Air conditioning system - Processes, Types and Working  
Principles. - Concept of RSHF, GSHF, ESHF- Cooling Load calculations.  

OUTCOMES:
- Upon completion of this course, the students can able to apply the different gas power cycles and  
use of them in IC and R&AC applications.

TEXT BOOKS:

REFERENCES:

ME6411      MANUFACTURING TECHNOLOGY LABORATORY – II  L T P C
0 0 3 2

OBJECTIVES:
- To Study and acquire knowledge on various basic machining operations in special purpose  
machines and its applications in real life manufacture of components in the industry
LIST OF EXPERIMENTS:
1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing machine
5. Gear generation in gear shaping machine
6. Plain Surface grinding
7. Cylindrical grinding
8. Tool angle grinding with tool and Cutter Grinder
9. Measurement of cutting forces in Milling / Turning Process
10. CNC Part Programming.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to use different machine tools to manufacturing gears.
- Ability to use different machine tools for finishing operations
- Ability to manufacture tools using cutter grinder
- Develop CNC part programming

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>Turret and Capstan Lathes</td>
<td>1 No each</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>2 No</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Surface Grinding Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>5</td>
<td>Cylindrical Grinding Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>6</td>
<td>Radial Drilling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>7</td>
<td>Lathe Tool Dynamometer</td>
<td>1 No</td>
</tr>
<tr>
<td>8</td>
<td>Milling Tool Dynamometer</td>
<td>1 No</td>
</tr>
<tr>
<td>9</td>
<td>Gear Hobbing Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>10</td>
<td>Tool Makers Microscope</td>
<td>1 No</td>
</tr>
<tr>
<td>11</td>
<td>CNC Lathe</td>
<td>1 No</td>
</tr>
<tr>
<td>12</td>
<td>CNC Milling machine</td>
<td>1 No</td>
</tr>
<tr>
<td>13</td>
<td>Gear Shaping machine</td>
<td>1 No</td>
</tr>
<tr>
<td>14</td>
<td>Centerless grinding machine</td>
<td>1 No</td>
</tr>
<tr>
<td>15</td>
<td>Tool and cutter grinder</td>
<td>1 No</td>
</tr>
</tbody>
</table>

ME6412 THERMAL ENGINEERING LABORATORY – I

OBJECTIVES:
- To study the value timing-V diagram and performance of IC Engines
- To Study the characteristics of fuels/Lubricates used in IC Engines
- To study the Performance of steam generator/ turbine
LIST OF EXPERIMENTS

I.C. ENGINE LAB

2. Actual p-v diagrams of IC engines.
5. Morse Test on Multi-cylinder Petrol Engine.
6. Retardation Test on a Diesel Engine.
7. Determination of Flash Point and Fire Point of various fuels / lubricants.

STEAM LAB

1. Study on Steam Generators and Turbines.

TOTAL: 45 PERIODS

OUTCOMES:

• Ability to conduct experiment on IC engine to study the characteristic and performance of IC design/ steam turbines.

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>I.C Engine – 2 stroke and 4 stroke model</td>
<td>1 set</td>
</tr>
<tr>
<td>2</td>
<td>Apparatus for Flash and Fire Point</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>4-stroke Diesel Engine with mechanical loading.</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>4-stroke Diesel Engine with hydraulic loading.</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>4-stroke Diesel Engine with electrical loading.</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Multi-cylinder Petrol Engine</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Single cylinder Petrol Engine</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Data Acquisition system with any one of the above engines</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Steam Boiler with turbine setup</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

CE6315 STRENGTH OF MATERIALS LABORATORY

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.

**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>
</tr>
</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>

**ME6501 COMPUTER AIDED DESIGN**

**OBJECTIVES:**
- To provide an overview of how computers are being used in mechanical component design

**UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS**
Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation

**UNIT II GEOMETRIC MODELING**
Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep

**UNIT III VISUAL REALISM**

**UNIT IV ASSEMBLY OF PARTS**
Assembly modelling – interferences of positions and orientation – tolerance analysis-massproperty calculations – mechanism simulation and interference checking.

**UNIT V CAD STANDARDS**
Standards for computer graphics - Graphical Kernel System (GKS) - standards for exchange images - Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALSetc. - communication standards.

OUTCOMES:
• Upon completion of this course, the students can able to use computer and CAD software’s for modeling of mechanical components

TEXT BOOKS:

REFERENCES:

ME6502 HEAT AND MASS TRANSFER

OBJECTIVES:
• To understand the mechanisms of heat transfer under steady and transient conditions.
• To understand the concepts of heat transfer through extended surfaces.
• To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.
(Use of standard HMT data book permitted)

UNIT I CONDUCTION

UNIT II CONVECTION

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS

UNIT IV RADIATION

UNIT V MASS TRANSFER

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to understand and apply different heat and mass transfer principles of different applications.

TEXT BOOK:

REFERENCE BOOKS:

ME6503 DESIGN OF MACHINE ELEMENTS 3 0 0 3

OBJECTIVES
• To familiarize the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components
(Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 10

UNIT II SHAFTS AND COUPLINGS 8
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines - Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS 9
Threaded fasteners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS
Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V BEARINGS
Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to successfully design machine components

TEXT BOOK:

REFERENCES:

ME6504 METROLOGY AND MEASUREMENTS

OBJECTIVES:
• To provide knowledge on various Metrological equipments available to measure the dimension of the components.
• To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

UNIT I BASICS OF METROLOGY

UNIT II LINEAR AND ANGULAR MEASUREMENTS

53

UNIT III ADVANCES IN METROLOGY 12

UNIT IV FORM MEASUREMENT 10
Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE 8

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the Students can demonstrate different measurement technologies and use of them in Industrial Components

TEXT BOOKS:

REFERENCES:

ME6505 DYNAMICS OF MACHINES L T P C
3 0 0 3

OBJECTIVES:
• To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
• To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.
• To understand the effect of Dynamics of undesirable vibrations.
• To understand the principles in mechanisms used for speed control and stability control.

UNIT I FORCE ANALYSIS 9

UNIT II BALANCING 9

UNIT III SINGLE DEGREE FREE VIBRATION

UNIT IV FORCED VIBRATION

UNIT V MECHANISM FOR CONTROL

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 BOOK:

REFERENCES:
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

OUTCOMES:
• 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:
6. World Community Service Centre, " Value Education", Vethathiri publications, Erode, 2011

Web sources:
ME6511  
DYNAMICS LABORATORY  
L  T  P  C  
0  0  3  2

OBJECTIVES:
• To supplement the principles learnt in kinematics and Dynamics of Machinery.
• To understand how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS
1. a) Study of gear parameters.  
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.  
   b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.  
   b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.  
   c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
   b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.  
   Undamped and Damped Natural frequencies.  
   b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses.  
   b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.  
   c) Determination of transmissibility ratio using vibrating table.

TOTAL : 45 PERIODS

OUTCOME
• Ability to demonstrate the principles of kinematics and dynamics of machinery
• Ability to use the measuring devices for dynamic testing.
### 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>Cam follower setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Motorised gyroscope.</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Governor apparatus - Watt, Porter, Proell and Hartnell governors.</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Whirling of shaft apparatus.</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Dynamic balancing machine.</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Two rotor vibration setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Spring mass vibration system.</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Torsional Vibration of single rotor system setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Gear Models</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Kinematic Models to study various mechanisms.</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Turn table apparatus.</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Transverse vibration setup of a) cantilever b) Free-Free beam c) Simply supported beam.</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

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**ME6512 THERMAL ENGINEERING LABORATORY – II**

**OBJECTIVES**

- To study the heat transfer phenomena predict the relevant coefficient using implementation
- To study the performance of refrigeration cycle / components

**LIST OF EXPERIMENTS:**

**HEAT TRANSFER LAB:**

1. Thermal conductivity measurement using guarded plate apparatus.
2. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.
3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
4. Determination of heat transfer coefficient under forced convection from a tube.
5. Determination of Thermal conductivity of composite wall.
6. Determination of Thermal conductivity of insulating powder.
7. Heat transfer from pin-fin apparatus (natural & forced convection modes)
8. Determination of Stefan – Boltzmann constant.
10. Effectiveness of Parallel / counter flow heat exchanger.

**REFRIGERATION AND AIR CONDITIONING LAB**

1. Determination of COP of a refrigeration system
2. Experiments on Psychrometric processes
3. Performance test on a reciprocating air compressor
4. Performance test in a HC Refrigeration System
5. Performance test in a fluidized Bed Cooling Tower

**TOTAL: 45 PERIODS**
OUTCOMES

- Ability to demonstrate the fundamentals of heat and predict the coefficient used in that transfer application and also design refrigeration cycle.

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>Guarded plate apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Lagged pipe apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Natural convection-vertical cylinder apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Forced convection inside tube apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Composite wall apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Thermal conductivity of insulating powder apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Pin-fin apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Stefan-Boltzmann apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Emissivity measurement apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Parallel/counter flow heat exchanger apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Single/two stage reciprocating air compressor</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Refrigeration test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>13</td>
<td>Air-conditioning test rig</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

ME6513 METROLOGY AND MEASUREMENTS LABORATORY

OBJECTIVES

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

LIST OF EXPERIMENTS

1. Tool Maker’s Microscope
2. Comparator
3. Sine Bar
4. Gear Tooth Vernier Caliper
5. Floating gauge Micrometer
6. Co ordinate Measuring Machine
7. Surface Finish Measuring Equipment
8. Vernier Height Gauge
9. Bore diameter measurement using telescope gauge
10. Bore diameter measurement using micrometer
11. Force Measurement
12. Torque Measurement
13. Temperature measurement
14. Autocollimator

TOTAL: 45 PERIODS

OUTCOMES

- Ability to handle different measurement tools and perform measurements in quality impulsion
## 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>Micrometer</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Vernier Caliper</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Vernier Height Gauge</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Vernier depth Gauge</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Slip Gauge Set</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Gear Tooth Vernier</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Sine Bar</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Floating Carriage Micrometer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Profile Projector / Tool Makers Microscope</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Parallel / counter flow heat exchanger apparatus</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Mechanical / Electrical / Pneumatic Comparator</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Autocollimator</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Temperature Measuring Setup</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Force Measuring Setup</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Torque Measuring Setup</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Coordinate measuring machine</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Surface finish measuring equipment</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Bore gauge</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Telescope gauge</td>
<td>1</td>
</tr>
</tbody>
</table>

### ME6601 DESIGN OF TRANSMISSION SYSTEMS

L T P C: 3 0 0 3

**OBJECTIVES:**

- To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues
  (Use of P S G Design Data Book permitted)

**UNIT I DESIGN OF FLEXIBLE ELEMENTS**

Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

**UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS**

Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears.

**UNIT III BEVEL, WORM AND CROSS HELICAL GEARS**

UNIT IV GEAR BOXES
Geometric progression - Standard step ratio - Ray diagram, kinematics layout - Design of sliding mesh gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box - Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

UNIT V CAMS, CLUTCHES AND BRAKES
Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches- Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe brake.

OUTCOMES:
• Upon completion of this course, the students can able to successfully design transmission components used in Engine and machines

TEXT BOOKS:

REFERENCES:

MG6851 PRINCIPLES OF MANAGEMENT

OBJECTIVES:
• To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.
UNIT I       INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS


UNIT II     PLANNING


UNIT III   ORGANISING


UNIT IV    DIRECTING


UNIT V     CONTROLLING

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

TOTAL: 45 PERIODS

OUTCOMES:

• Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:


REFERENCES:

OBJECTIVES:
- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system.

UNIT I VEHICLE STRUCTURE AND ENGINES
Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines –components-functions and materials, variable valve timing (VVT).

UNIT II ENGINE AUXILIARY SYSTEMS
Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III TRANSMISSION SYSTEMS
Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints ,Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS
Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

UNIT V ALTERNATIVE ENERGY SOURCES
Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students will be able to identify the different components in automobile engineering.
- Have clear understanding on different auxiliary and transmission systems usual.

TEXT BOOKS:

REFERENCES:
ME6603  FINITE ELEMENT ANALYSIS  L T P C 3 0 0 3

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

UNIT I  INTRODUCTION

UNIT II  ONE-DIMENSIONAL PROBLEMS

UNIT III  TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS

UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V  ISOPARAMETRIC FORMULATION

TOTAL : 45 PERIODS

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

TEXT BOOK:
REFERENCES:

ME6604 GAS DYNAMICS AND JET PROPULSION

OBJECTIVES:
- To understand the basic difference between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion. (Use of Standard Gas Tables permitted)

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS
Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers

UNIT II FLOW THROUGH DUCTS
Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties.

UNIT III NORMAL AND OBLIQUE SHOCKS
Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Applications.

UNIT IV JET PROPULSION
Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operating principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines.

UNIT V SPACE PROPULSION

OUTCOMES:
- Upon completion of this course, the students can able to successfully apply gas dynamics principles in the Jet and Space Propulsion
TEXT BOOKS:

REFERENCES:

ME6611 CAD / CAM LABORATORY

OBJECTIVES:
• To gain practical experience in handling 2D drafting and 3D modelling software systems.
• To study the features of CNC Machine Tool.
• To expose students to modern control systems (Fanuc, Siemens etc.,)
• To know the application of various CNC machines like CNC lathe, CNC Vertical Machining centre, CNC EDM and CNC wire-cut and studying of Rapid prototyping.

LIST OF EXPERIMENTS

1. 3D GEOMETRIC MODELLING

List of Experiments
1. Introduction of 3D Modelling software

Creation of 3D assembly model of following machine elements using 3D Modelling software
2. Flange Coupling
3. Plummer Block
4. Screw Jack
5. Lathe Tailstock
6. Universal Joint
7. Machine Vice
8. Stuffing box
9. Crosshead
10. Safety Valves
11. Non-return valves
12. Connecting rod
13. Piston
14. Crankshaft
* Students may also be trained in manual drawing of some of the above components

(i) Part Programming - CNC Machining Centre
a) Linear Cutting.
b) Circular cutting.
c) Cutter Radius Compensation.
d) Canned Cycle Operations.
(ii) Part Programming - CNC Turning Centre
a) Straight, Taper and Radius Turning.
b) Thread Cutting.
c) Rough and Finish Turning Cycle.
d) Drilling and Tapping Cycle.

3. Computer Aided Part Programming
  e) CL Data and Post process generation using CAM packages.
  f) Application of CAPP in Machining and Turning Centre.

TOTAL: 45 PERIODS

OUTCOMES
• Ability to develop 2D and 3D models using modeling softwares.
• Ability to understand the CNC control in modern manufacturing system.
• Ability to prepare CNC part programming and perform manufacturing.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HARDWARE</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Computer Server</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server</td>
<td>30</td>
</tr>
<tr>
<td>3.</td>
<td>A3 size plotter</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Laser Printer</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>CNC Lathe</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>CNC milling machine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SOFTWARE</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Any High end integrated modeling and manufacturing CAD / CAM software</td>
<td>15 licenses</td>
</tr>
<tr>
<td>8.</td>
<td>CAM Software for machining centre and turning centre (CNC Programming and tool path simulation for FANUC / Sinumeric and Heidenhain controller)</td>
<td>15 licenses</td>
</tr>
<tr>
<td>9.</td>
<td>Licensed operating system</td>
<td>Adequate</td>
</tr>
<tr>
<td>10.</td>
<td>Support for CAPP</td>
<td>Adequate</td>
</tr>
</tbody>
</table>
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.

OBJECTIVES:
- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I LISTENING / VIEWING
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions... so on.

UNIT II SPEAKING

UNIT III READING
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV WRITING
UNIT V  VOCABULARY  8
Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI  GRAMMAR  8
Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

TOTAL: 60 PERIODS

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.

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>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Client Systems</td>
<td>60 Nos.</td>
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<tr>
<td></td>
<td>• PIII System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Handicam</td>
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<tr>
<td>4</td>
<td>Television 46&quot;</td>
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<tr>
<td>5</td>
<td>Collar mike</td>
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</tr>
<tr>
<td>6</td>
<td>Cordless mike</td>
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</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
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</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
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</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>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.
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, case studies and abstract concept

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:

Web Sources:
www.humanresources.about.com
www.careerride.com

ME6701 POWER PLANT ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 10
UNIT II  DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS  
Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine 
power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III  NUCLEAR POWER PLANTS  
Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear 
Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-
Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures 
for Nuclear Power plants.

UNIT IV  POWER FROM RENEWABLE ENERGY  
Hydro Electric Power Plants – Classification, Typical Layout and associated components including 
Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar 
Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V  ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS  
Power tariff types, Load distribution parameters, load curve. Comparison of site selection criteria, 
relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control 
technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to understand different types of power 
plant, and its functions and their flow lines and issues related to them.
• Analyse and solve energy and economic related issues in power sectors.

TEXT BOOK:
Ltd., 2008.

REFERENCES:
2010.
4. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association 
with the Open University, 2004.

ME6702  MECHATRONICS  
L T P C  3 0 0 3

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  
Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for 
Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and 
Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance
sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors

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 MECHATRONIC SYSTEM DESIGN


TOTAL : 45 PERIODS

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:


ME6703 – COMPUTER INTEGRATED MANUFACTURING SYSTEMS

OBJECTIVES:

• To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.
UNIT I  INTRODUCTION
10

UNIT II  PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING
10

UNIT III  CELLULAR MANUFACTURING
9

UNIT IV  FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)
8

UNIT V  INDUSTRIAL ROBOTICS
8

OUTCOMES:
• Upon completion of this course, the student can able to understand the use of computers in process planning and use of FMS and Robotics in CIM

TEXT BOOK:

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

UNIT I  INTRODUCTION

UNIT II  TQM PRINCIPLES
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
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

UNIT V  QUALITY SYSTEMS

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

TEXT BOOK:

REFERENCES:
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 Multibody Dynamic 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.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the Students can model, analyse and simulate experiments to meet real world system and evaluate the performance.

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 Work Station</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Color Desk Jet Printer</td>
<td>01</td>
</tr>
<tr>
<td>3</td>
<td>Multibody Dynamic Software Suitable for Mechanism</td>
<td>15 licenses</td>
</tr>
<tr>
<td></td>
<td>simulation and analysis</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C / MATLAB</td>
<td>5 licenses</td>
</tr>
</tbody>
</table>

ME6712 MECHATRONICS LABORATORY

OBJECTIVES:
• To know the method of programming the microprocessor and also the design, modeling & analysis of basic electrical, hydraulic & pneumatic Systems which enable the students to understand the concept of mechatronics.

LIST OF EXPERIMENTS:
2. Stepper motor interface.
4. Speed control of DC motor.
5. Study of various types of transducers.
7. Modelling and analysis of basic hydraulic, pneumatic and electrical circuits using Software.
8. Study of PLC and its applications.
9. Study of image processing technique.

TOTAL : 45 PERIODS

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.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. 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 each</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Basic Hydraulic Trainer Kit</td>
<td>1 No</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulics and Pneumatics Systems Simulation Software</td>
<td>10 No</td>
</tr>
<tr>
<td>4</td>
<td>8051 - Microcontroller kit with stepper motor and drive circuit sets</td>
<td>2 No</td>
</tr>
<tr>
<td></td>
<td>Image processing system with hardware &amp; software</td>
<td>1 No.</td>
</tr>
</tbody>
</table>
UNIT I INTRODUCTION TO ECONOMICS

UNIT II VALUE ENGINEERING
Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS
Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION

TOTAL: 45 PERIODS

OUTCOMES:
• Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions.

TEXT BOOKS:

REFERENCES:
ME6811  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.

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.

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
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
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic - Psycho graphic and geographic segmentation, process, patterns.

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

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

UNIT V  ADVERTISING, SALES PROMOTION AND DISTRIBUTION

TOTAL: 180 PERIODS

TOTAL: 45 PERIODS
OUTCOMES:
- The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXT BOOKS:

REFERENCES:

ME6001 QUALITY CONTROL AND RELIABILITY ENGINEERING

OBJECTIVES:
- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES
Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process causes of variation –Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and chart -process capability – process capability studies and simple problems. Six sigma concepts

UNIT II PROCESS CONTROL FOR ATTRIBUTES
Control chart for attributes –control chart for non conformings– p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III ACCEPTANCE SAMPLING

UNIT IV LIFE TESTING – RELIABILITY
UNIT V  QUALITY AND RELIABILITY

Note: Use of approved statistical table permitted in the examination.

OUTCOMES:
• Upon successful completion of this course, the students can able to apply the concept of SQC in process control for reliable component production

TEXT BOOKS:

REFERENCES:

ME6002  REFRIGERATION AND AIR CONDITIONING  L T P C
3 0 0 3

OBJECTIVES:
• To understand the underlying principles of operations in different Refrigeration & Air conditioning systems and components.
• To provide knowledge on design aspects of Refrigeration & Air conditioning systems

UNIT I  INTRODUCTION
Introduction to Refrigeration - Unit of Refrigeration and C.O.P.– Ideal cycles- Refrigerants Desirable properties – Classification - Nomenclature - ODP & GWP.

UNIT II  VAPOUR COMPRESSION REFRIGERATION SYSTEM

UNIT III  OTHER REFRIGERATION SYSTEMS
Working principles of Vapour absorption systems and adsorption cooling systems – Steam jet refrigeration- Ejector refrigeration systems- Thermoelectric refrigeration- Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.

80
UNIT IV   PSYCHROMETRIC PROPERTIES AND PROCESSES  10
Properties of moist Air-Gibbs Dalton law, Specific humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temperature Thermodynamic wet bulb temperature, Psychrometric chart; Psychrometric of air-conditioning processes, mixing of air streams.

UNIT V   AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION  12
Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system; Filters; Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls.

OUTCOMES:
• Upon completion of this course, the students can able to demonstrate the operations in different Refrigeration & Air conditioning systems and also able to design Refrigeration & Air conditioning systems.

TEXT BOOK:

REFERENCES:

ME6003   RENEWABLE SOURCES OF ENERGY  L T P C  3 0 0 3

OBJECTIVES:
• At the end of the course, the students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.

UNIT I   INTRODUCTION  9

UNIT II   SOLAR ENERGY  9

UNIT III   WIND ENERGY  9
UNIT IV  BIO - ENERGY 9
Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production –
Bio diesel – Cogeneration - Biomass Applications

UNIT V  OTHER RENEWABLE ENERGY SOURCES 9
Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy –

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to identify the new methodologies /
technologies for effective utilization of renewable energy sources.

TEXT BOOKS:

REFERENCES:
2. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press,
U.K., 1996.
6. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA
2010

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
Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic
Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process
parameters – MRR- Applications.

UNIT III  ELECTRICAL ENERGY BASED PROCESSES  9
Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface
Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing –
Wire cut EDM – Applications.
UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

UNIT V THERMAL ENERGY BASED PROCESSES
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:

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
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II PROCESS PLANNING ACTIVITIES
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
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:

REFERENCES:

ME6006 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS L T P C
3 0 0 3

OBJECTIVES:
• To understand the functions and design principles of Jigs, fixtures and press tools
• To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES: 8

UNIT II JIGS AND FIXTURES 10
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 10
UNIT IV  BENDING AND DRAWING DIES  10

UNIT V  OTHER FORMING TECHNIQUES  7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

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.

TEXT BOOKS:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.

ME6007  COMPOSITE MATERIALS AND MECHANICS  L T P C  3 0 0 3
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
Orthotropic Lamina – Transformation Matrix, Transformed Stiffness. Manufacturing: Bag Moulding
Compression Moulding – Pultrusion – Filament Winding – Other Manufacturing Processes

UNIT II  FLAT PLATE LAMINATE CONSTITUTE EQUATIONS  10
Definition of stress and Moment Resultants. Strain Displacement relations. Basic Assumptions of
Laminated anisotropic plates. Laminate Constitutive Equations – Coupling Interactions, Balanced
Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates. Laminate Structural

UNIT III  LAMINA STRENGTH ANALYSIS  5
Generalized Hill’s Criterion for Anisotropic materials. Tsai-Hill’s Failure Criterion for Composites.
Tensor Polynomial (Tsai-Wu) Failure criterion. Prediction of laminate Failure

UNIT IV  THERMAL ANALYSIS  8
Assumption of Constant C.T.E’s. Modification of Hooke’s Law. Modification of Laminate Constitutive
Equations. Orthotropic Lamina C.T.E’s. C.T.E’s for special Laminate Configurations – Unidirectional,
Off-axis, Symmetric Balanced Laminates, Zero C.T.E laminates, Thermally Quasi-Isotropic Laminates

UNIT V  ANALYSIS OF LAMINATED FLAT PLATES  10
Free Vibrations – Natural Frequencies

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:
   CRC press in progress, 1994, -.

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.

TOTAL : 45 HOURS

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:
At the end of the course, the student is expected to
• understand and analyse the energy data of industries
• carryout energy accounting and balancing
• conduct energy audit and suggest methodologies for energy savings and
• utilise the available resources in optimal ways

UNIT I \hspace{1cm} INTRODUCTION

UNIT II \hspace{1cm} ELECTRICAL SYSTEMS

UNIT III \hspace{1cm} THERMAL SYSTEMS

UNIT IV \hspace{1cm} ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V \hspace{1cm} ECONOMICS
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.
• Can carryout energy accounting and balancing
• Can suggest methodologies for energy savings

TEXT BOOKS:

REFERENCES:
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  6
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  9
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  12

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  13
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  5
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

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, MOMBE.

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-functionallization 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 nanomaterials

TEXT BOOKS

REFERENCES

ME6011 THERMAL TURBO MACHINES

OBJECTIVES:

- To understand the various systems, principles, operations and applications of different types of turbo machinery components.

UNIT I PRINCIPLES
Energy transfer between fluid and rotor-classification of fluid machinery,-dimensionless parameters-specific speed-applications-stage velocity triangles-work and efficiency.

UNIT II CENTRIFUGAL FANS AND BLOWERS
Types- stage and design parameters-flow analysis in impeller blades-volute and diffusers, losses, characteristic curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR
Construction details, impeller flow losses, slip factor, diffuser analysis, losses and performance curves.

UNIT IV AXIAL FLOW COMPRESSOR
Stage velocity diagrams, enthalpy-entropy diagrams, stage losses and efficiency, work done simple stage design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES
Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to explain the various systems, principles and applications and different types of turbo machinery components.
TEXT BOOKS:

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  9

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE  9
Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING  9
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  10
Repair methods for beds, slide ways, 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  8
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:

EE6007 MICRO ELECTRO MECHANICAL SYSTEMS L T P C 3 0 0 3

OBJECTIVES
• To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
• To educate on the rudiments of Micro fabrication techniques.
• To introduce various sensors and actuators
• To introduce different materials used for MEMS
• To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION 9
Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators –
Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of
Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis –
Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9
Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor –
Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal
expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic
Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation
using Shape Memory Alloys

UNIT III SENSORS AND ACTUATORS-II 9
Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements –
Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators –
piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow
sensors.
UNIT IV  
MICROMACHINING
Silicon Anisotropic Etching – Anisotropic Wet Etching – Dry Etching of Silicon – Plasma Etching –
Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies -
Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of
sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS –
Foundry process.

UNIT V  
POLYMER AND OPTICAL MEMS
Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene –
Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS –
Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 PERIODS

OUTCOMES
• Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory
  control theory and apply them to electrical engineering problems.
• Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:
  Smart Devices", John Wiley & Son LTD,2002
  Springer 2012.

IE6605  
PRODUCTION PLANNING AND CONTROL  
L T P C  
3 0 0 3

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.

TOTAL: 45 PERIODS

OUTCOMES:
• 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 BOOKS:

REFERENCES:
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

UNIT II MOTIVATION
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

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

TOTAL : 45 PERIODS

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

TEXT BOOKS :

REFERENCES :
ME6013  DESIGN OF PRESSURE VESSELS AND PIPING  L T P C  3 0 0 3

OBJECTIVES:
- To understand the Mathematical knowledge to design pressure vessels and piping
- To understand the ability to carry of stress analysis in pressure vessels and piping

UNIT I  INTRODUCTION  3

UNIT II  STRESSES IN PRESSURE VESSELS  15

UNIT III  DESIGN OF VESSELS  15
Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design.

UNIT IV  BUCKLING AND FRACTURE ANALYSIS IN VESSELS  8
Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading.

UNIT V  PIPING  4

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the mathematical fundamental for the design of pressure vessels and pipes. Further they can able to analyse and design of pressure vessels and piping.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce Governing Equations of viscous fluid flows
- To introduce numerical modeling and its role in the field of fluid flow and heat transfer
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I  GOVERNING EQUATIONS AND BOUNDARY CONDITIONS  8

UNIT II  FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION  9

UNIT III  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  10
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV  FLOW FIELD ANALYSIS  9

UNIT V  TURBULENCE MODELS AND MESH GENERATION  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able
- To create numerical modeling and its role in the field of fluid flow and heat transfer
- To use the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems.

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

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 BOOK:

REFERENCES:

ME6016 ADVANCED I.C ENGINES

L T P C
3 0 0 3

OBJECTIVES:
• To understand the underlying principles of operation of different IC Engines and components.
• To provide knowledge on pollutant formation, control, alternate fuel etc.

UNIT I SPARK IGNITION ENGINES

UNIT II COMPRESSION IGNITION ENGINES

UNIT III POLLUTANT FORMATION AND CONTROL

UNIT IV ALTERNATIVE FUELS
Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications.

UNIT V RECENT TRENDS

TOTAL : 45 PERIODS

OUTCOME:
• Upon completion of this course, the students can able to compare the operations of different IC Engine and components and can evaluate the pollutant formation, control, alternate fuel

TEXT BOOKS:
REFERENCES:

ME6017 DESIGN OF HEAT EXCHANGERS

OBJECTIVES:
• To learn the thermal and stress analysis on various parts of the heat exchangers
• To analyze the sizing and rating of the heat exchangers for various applications

UNIT I INTRODUCTION
Types of heat exchangers, shell and tube heat exchangers – regenerators and recuperators - Temperature distribution and its implications - Parts description, Classification as per Tubular Exchanger Manufacturers Association (TEMA)

UNIT II PROCESS DESIGN OF HEAT EXCHANGERS

UNIT III STRESS ANALYSIS
Stress in tubes – header sheets and pressure vessels – thermal stresses, shear stresses - types of failures, buckling of tubes, flow induced vibration.

UNIT IV COMPACT AND PLATE HEAT EXCHANGER
Types- Merits and Demerits- Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations.

UNIT V CONDENSERS AND COOLING TOWERS
Design of surface and evaporative condensers – cooling tower – performance characteristics.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the mathematical knowledge for thermal and stress analysis on various parts of the heat exchangers components.

TEXT BOOKS:

REFERENCES:

ME6018 ADDITIVE MANUFACTURING

L T P C
3 0 0 3

OBJECTIVES:
• To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturing technologies
• To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.

UNIT I INTRODUCTION

UNIT II CAD & REVERSE ENGINEERING

UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS
Classification – Liquid based system – Stereolithography Apparatus (SLA) - Principle, process, advantages and applications - Solid based system –Fused Deposition Modeling - Principle, process, advantages and applications, Laminated Object Manufacturing

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS

UNIT V MEDICAL AND BIO-ADDITIVE MANUFACTURING
Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Case studies

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to compare different method and discuss the effects of the Additive Manufacturing technologies and analyse the characteristics of the different materials in Additive Manufacturing.

TEXT BOOKS:

REFERENCES:

ME6019 NON DESTRUCTIVE TESTING AND MATERIALS

OBJECTIVES:
• To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I OVERVIEW OF NDT
NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided.

UNIT II SURFACE NDE METHODS

UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING (ET)

UNIT IV ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)

UNIT V RADIOGRAPHY (RT)
Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films - graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

OUTCOMES:
• Upon completion of this course, the students can able to use the various Non Destructive Testing and Testing methods understand for defects and characterization of industrial components

TEXT BOOKS:
REFERENCES:

ME6020 VIBRATION AND NOISE CONTROL

OBJECTIVES:
- The student will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components.

UNIT I BASICS OF VIBRATION
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II BASICS OF NOISE
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES

UNIT IV CONTROL TECHNIQUES
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCE OF NOISE AND CONTROL
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

TOTAL: 45 PERIODS
OUTCOMES:
- Understanding causes, source and types of vibrations in machineries
- Gaining knowledge in sources and measurement standard of noise
- Ability to design and develop vibrations and noise control systems.

TEXT BOOKS:

REFERENCES: