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

## SEMESTER I

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**LIST OF ELECTIVES FOR B.E. MANUFACTURING ENGINEERING**

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<td>GE6081</td>
<td>Fundamentals of Nanoscience</td>
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<td>Disaster Management</td>
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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 9+3
Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast and telecast from Radio and TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email; Writing - Creative writing,
Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar and Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

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

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

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

WEBSITES:

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

EVALUATION PATTERN:

Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like
• Project
• Assignment
• Reviews
• Creative writing
• Poster making, etc.
All the four skills are to be tested with equal weightage given to each.

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

End Semester Examination: 80%

MA6151 MATHEMATICS – I

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

UNIT I MATRICES

UNIT II SEQUENCES AND SERIES

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS
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

UNIT V MULTIPLE INTEGRALS

TOTAL (L:45+T:15): 60 PERIODS
OUTCOMES:
- This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

TEXT BOOKS:

REFERENCES:

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

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

UNIT I CRYSTAL PHYSICS
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment) - Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS

UNIT III QUANTUM PHYSICS
UNIT IV ACoustics and uLtrasonics


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

UNIT V PhotoniCs anD FibeR oPTiCS


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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

REFERENCES:

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

CY6151 ENGINEERING CHEMISTRY - I

OBJECTIVES:

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

UNIT I POLYMER CHEMISTRY

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.
UNIT II  CHEMICAL THERMODYNAMICS  
Terminology of thermodynamics - Second law: entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochores (problems).

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  

UNIT IV  PHASE RULE AND ALLOYS  

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

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

TEXT BOOKS:

REFERENCES:

GE6151  COMPUTER PROGRAMMING  
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 L T P C
2 0 3 4

OBJECTIVES:
• To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
• To expose them to existing national standards related to technical drawings.
CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I    PLANE CURVES AND FREE HAND SKETCHING 5+9

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACES 5+9
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

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

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

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

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

TOTAL : 75 PERIODS

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

TEXT BOOK:
REFERENCES:

Publication of Bureau of Indian Standards:

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

GE6161 COMPUTER PRACTICES LABORATORY L T P C
0 0 3 2

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.

TOTAL : 45 PERIODS

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.

GE6162 ENGINEERING PRACTICES LABORATORY L T P C
0 0 3 2

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 10
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 13
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
GE6163 PHYSICS AND CHEMISTRY 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 - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. ‘rock’, ‘train’, ‘ring’); E-materials - Interactive exercise on Grammar and vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials – Attending a meeting and writing minutes.

UNIT IV
Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.
UNIT V
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

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

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

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

Websites
2. http://owl.english.purdue.edu

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

EVALUATION PATTERN:

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

End Semester Examination: 80%

MA6251 MATHEMATICS – II

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

UNIT I VECTOR CALCULUS 9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –
Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem
(excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3
Higher order linear differential equations with constant coefficients – Method of variation of
parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear
equations with constant coefficients.

UNIT III LAPLACE TRANSFORM 9+3
Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic
properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of
transforms - Transforms of unit step function and impulse functions – Transform of periodic
functions. Inverse Laplace transform -Statement of Convolution theorem – Initial and final value
theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

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

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

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

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

TEXT BOOKS:

REFERENCES:

PH6251 ENGINEERING PHYSICS – II L T P C
3 0 0 3

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
Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -
direct and indirect band gap - derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect – Determination of Hall coefficient – Applications.

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

UNIT IV DIELECTRIC MATERIALS

UNIT V ADVANCED ENGINEERING MATERIALS

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCES:

CY6251 ENGINEERING CHEMISTRY - II
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
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
Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation
potential- reduction potential, measurement and applications - electrochemical series and its
significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types-
chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material
selection and design aspects - electrochemical protection – sacrificial anode method and
impressed current cathodic method. Paints- constituents and function. Electroplating of Copper
and electroless plating of nickel.

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

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

UNIT V  FUELS AND COMBUSTION
9
Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal-
analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto
Hoffmann method) - petroleum- manufacture of synthetic petrol (Bergius process)- knocking-
octane number - diesel oil- cetane number - natural gas- compressed natural gas (CNG)- liquefied
petroleum gases(LPG)- producer gas- water gas. Power alcohol and bio diesel. Combustion of
fuels: introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and
air ratio- ignition temperature- explosive range - flue gas analysis (ORSAT Method).

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:
1. Vairam S, Kalyani P and SubaRamesh.,“Engineering Chemistry”. Wiley India PvtLtd., New
Delhi., 2011

REFERENCES:
Company Pvt. Ltd. Chennai, 2009
3. RenuBapna and Renu Gupta., “Engineering Chemistry”, Macmillan India Publisher Ltd.,
2010.
OBJECTIVES:

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

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS

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

UNIT II ELECTRICAL MECHANICS


UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS


UNIT IV DIGITAL ELECTRONICS


UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING

- 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:

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

UNIT IV  DYNAMICS OF PARTICLES  12

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

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 L T P C 0 1 2 2

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 B-spline 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>
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

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:
publishers, Singapore, 1996.


- Laboratory classes on alternate weeks for Physics and Chemistry.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

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

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

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**MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

**L T P C**

3 1 0 4

**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

ME6403 ENGINEERING MATERIALS AND METALLURGY L T P C 3 0 0 3

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 9

UNIT II HEAT TREATMENT 10

UNIT III FERROUS AND NON-FERROUS METALS 9
UNIT IV NON-METALLIC MATERIALS
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, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes); Engineering Ceramics – Properties and applications of $\text{Al}_2\text{O}_3$, SiC, Si$_3$N$_4$, PSZ and SIALON – Composites - Classifications - Metal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

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

TEXT BOOKS:

REFERENCES:

EE6351 ELECTRICAL DRIVES AND CONTROLS

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

UNIT I INTRODUCTION
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

UNIT II DRIVE MOTOR CHARACTERISTICS
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:

CE6306  STRENGTH OF MATERIALS  L T P C
3 1 0 4

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

UNIT I  STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III  TORSION
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
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:

AT6302 MECHANICS OF MACHINES L T P C
3 1 0 4

OBJECTIVES:
- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyse the forces and toques acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I KINEMATIC OF MECHANICS 10

UNIT II GEARS and GEAR TRAINS 9

UNIT III FRICTION 8

UNIT IV FORCE ANALYSIS 9
UNIT V BALANCING AND VIBRATION


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

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

TEXT BOOKS:

REFERENCES:

MF6301 MANUFACTURING PROCESSES - I

OBJECTIVES:
At the end of this course the student should be able to understand
- Methods to solve problems on cutting forces, tool life and analytical methods of estimating cutting temperature.
- Constructional features of lathe, drilling, shaper, planer, boring, broaching, and grinding machines, accessories and common operations performed on these machines.
- Machine tool structures, erection and testing of machine tools
- Concept of automation of machine tools.

UNIT I FUNDAMENTALS OF METAL CUTTING

UNIT II BASIC MACHINING PROCESSES
UNIT III GRINDING AND FINISHING OPERATIONS
8

UNIT IV GEAR CUTTING
8
Gear cutting methods-Kinematics of gear shaping and gear hobbing – template gear cutting methods-Gear generation principles specifications - Bevel gear generator - Gear finishing methods-gear grinding -lapping

UNIT V MACHINE TOOL STRUCTURE AND AUTOMATION
8
Classification Machine tool structures-Vibration and chatters in machining-erecting and testing of machine tools-Automation: Cam controlled automats, single spindle and multi spindle automats - Swiss type, automatic screw mechanism - Feeding mechanism - Transfer mechanism, Tracer controller mechanism.

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

TEXT BOOKS:

REFERENCES:

CE6315 STRENGTH OF MATERIALS LABORATORY
L T P C
0 0 3 2
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 in 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>

EE6364 ELECTRICAL ENGINEERING AND MEASUREMENTS LABORATORY

OBJECTIVES:
To impart practical knowledge on
   I. Characteristic of different machines
   II. Method of speed control of machines
   III. Measurement of various electrical parameters

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

OUTCOMES
- Ability to perform speed characteristic of different electrical machine.
- Ability to measure various electrical parameter.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. DC & AC Starters
2. Transducers
3. Wheatstone Bridge & Schering Bridge
4. ADC & DAC Converters
5. DC Shunt Motor
6. Single-Phase Transformer
7. Three-Phase Induction Motor

ME6311              MANUFACTURING TECHNOLOGY LABORATORY – I               L T P C
                                       0 0 3 2

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 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>
</tr>
</thead>
<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>

MA6468              PROBABILITY AND STATISTICS               L T P C
                                       3 1 0 4

OBJECTIVES
• This course aims at providing the required skill to apply the statistical tools in engineering problems.

UNIT I    RANDOM VARIABLES      9 + 3
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II   TWO - DIMENSIONAL RANDOM VARIABLES     9 + 3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).
UNIT III TESTING OF HYPOTHESIS  9 + 3
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

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

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

OUTCOMES
- The students will have a fundamental knowledge of the concepts of probability. Have knowledge of standard distributions which can describe real life phenomenon. Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS

REFERENCES

MF6401 MANUFACTURING PROCESSES – II  L T P C
3 0 0 3

OBJECTIVES:
At the end of this course the student should be able to understand
- The tools, equipment and principle of operation of primary and secondary manufacturing processes.
- Defects, causes and their remedies of welding, casting and metal forming operations.
- Processing of plastics and fabrication of various types composite material.
- Equipment, principle of operation of non traditional machining and forming processes.

UNIT I CASTING PROCESSES  9
UNIT II METAL FORMING PROCESSES 9
Hot working & Cold working of metals – Forging Machines - Forging operations– Rolling- Types of
Rolling mills – Rolling operations – Extrusion – Extrusion processes– Rod, wire and tube drawing -
Bending – Principle & types- Deep drawing – Principle & Types Sheet metal forming operations
such as squeezing, spinning, peen ,stretch forming and super plastic forming.

UNIT III FABRICATION PROCESSES 9
Welding – Classification of welding – Electric Arc Welding- Equipment – Consumables –
welding – Soldering & Brazing – Adhesive bonding – Welding Inspection – Defects, Causes &
Remedies.

UNIT IV PROCESSING OF PLASTICS AND COMPOSITES 9
Types of plastics – Processing of thermo plastics – Extrusion, Inspection blow, Rotatromal
moulding processes – Calendaring, Film blowing, Thermo forming – Processing of thermosets -
Compression, Transfer, Jet Moulding processes – Bonding of thermoplastics- Laminated plastic —
Composites- types- Fabrication Methods –advantages ,limitations and applications.

UNIT V UNCONVENTIONAL METHODS OF MANUFACTURING 9
Introduction – Need –classification -Electro-Discharge Machining – Electro-Chemical Machining –
Laser Beam Machining – Abrasive Jet Machining –Water jet Cutting – Ultrasonic Machining —
High Velocity Forming of Metals – Explosive Fabrication – Hydro forming – Electro-hydraulic
Forming – Magnetic pulse Forming – Electron Beam Machining.

TOTAL : 45 PERIODS

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

TEXT BOOK:
1. S.Gowri, P.Hariharan, A.Suresh Babu “Manufacturing Technology-I”,Pearson Education,
   2008

REFERENCES:
   Ltd., New Delhi, 2007.
   2008.

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 8
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific
gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow
characteristics – concept of control volume - application of continuity equation, energy equation
and momentum equation.
UNIT II  FLOW THROUGH CIRCULAR CONDUITS

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

UNIT IV  PUMPS

UNIT V  TURBINES

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCES:

MF6402  MACHINE DESIGN  L T P C
3 1 0 4

OBJECTIVES:
• To familiarise 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
Introduction to the design process – factor influencing machine design, selection of materials based on mechanical properties – Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and ‘C’ frame –

UNIT II  DESIGN OF SHAFTS AND COUPLINGS  10

UNIT III  DESIGN OF TEMPORARY AND PERMANENT JOINTS  9

UNIT IV  DESIGN OF ENERGY STORING ELEMENTS  8
Design of various types of springs, optimization of helical springs – rubber springs – Design of flywheels considering stresses in rims and arms, for engines and punching machines.

UNIT V  DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS  9
Sliding contact and rolling contact bearings – Design of hydrodynamic journal bearings, McKee’s Eqn., Sommerfield Number, Raimondi & Boyd – Selection of Rolling Contact bearings – Design of Seals and Gaskets – Design of Connecting Rod.

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

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

TEXT BOOKS:

REFERENCES:

MF6403  THERMODYNAMICS  L T P C  4 0 0 4

OBJECTIVES:
• To understand the basic laws of thermodynamics and heat transfer.
• To understand the principle of operation of thermal equipments like IC engine, boilers, turbine and refrigerator etc.

UNIT I  BASIC CONCEPTS OF THERMODYNAMICS  9

UNIT II  FIRST AND SECOND LAW OF THERMODYNAMICS  9
First law of thermodynamics – Energy balance for closed systems and steady flow systems – Applications of First law of Thermodynamics – Energy balance for Unsteady flow processes –
Second law of Thermodynamics – Entropy – Carnot principles – Change in Entropy – Entropy and irreversibility -Applications.

UNIT III HEAT ENGINES

UNIT IV GASES AND VAPOUR MIXTURES

UNIT V HEAT TRANSFER

TOTAL : 60 PERIODS

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

TEXT BOOKS

REFERENCES:

MF6404 ENGINEERING METROLOGY

OBJECTIVES:
• To teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries. Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

UNIT I BASIC CONCEPTS OF MEASUREMENTS

UNIT II LINEAR AND ANGULAR MEASUREMENTS
UNIT III  FORM MEASUREMENTS 9

UNIT IV  OPTICAL MEASUREMENTS 10

UNIT V  ADVANCES IN METROLOGY 9

TOTAL:45 PERIODS

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

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>

CE6461    FLUID MECHANICS AND MACHINERY LABORATORY     L T P C
0  0  3  2

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 Rotameter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump.
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

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

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>Orifice meter setup</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Venturi meter setup</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Rotameter setup</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pipe Flow analysis setup</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Centrifugal pump/submergible pump 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>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Francis turbine setup</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Kaplan turbine setup</td>
<td>1</td>
</tr>
</tbody>
</table>
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.

<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>

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

TOTAL : 45 PERIODS
OBJECTIVE:
At the end of this course the student should be able to understand
- Melting procedure of various materials
- Design principles of welding and casting
- Principles of advanced welding and casting processes
- Automation of welding and casting plant

UNIT I MELTING AND POURING

UNIT II CASTING DESIGN
Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner ,gate and risers-problems in design and manufacture of thin and unequal sections-designing for directional solidification, minimum distortion and for overall economy-design problems of L,T,V,X and Y junctions.

UNIT III WELD DESIGN AND WELDING METALLURGY
Design of welded components-symbolic representation of welds on drawings- welding classes-residual stresses in welds-weld distortions-design consideration-strength consideration of welded joints-analysis of statistically loaded welded joints-welded structures subjected to fatigue loads.

UNIT IV SPECIAL CASTING AND WELDING PROCESSES

UNIT V QUALITY CONTROL AND AUTOMATION

TOTAL: 45 PERIODS

OUTCOMES
- Ability to design welding and casting component
- Ability to perform quality control and inspection.

TEXT BOOKS

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

UNIT I  FUNDAMENTALS OF METAL FORMING  15

UNIT II  FORGING AND ROLLING  10

UNIT III  EXTRUSION AND DRAWING PROCESSES  15

UNIT IV  SHEET METAL FORMING PROCESSES  10

UNIT V  RECENT ADVANCES  10

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

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

REFERENCES:
OBJECTIVES:

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

UNIT I CONCEPTS OF ACCURACY AND MACHINE TOOLS


UNIT II STIFFNESS, THERMAL EFFECTS AND FINISH MACHINING


UNIT III DIMENSIONING

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

UNIT IV MICRO-MACHINING MICRO FABRICATION


UNIT V SMART STRUCTURES, MATERIALS AND MICRO ACTUATORS


TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:


REFERENCES:


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 exchangeimages- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALSetc. - communication standards.

TOTAL : 45 PERIODS

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:

MF6504  HYDRAULICS AND PNEUMATICS  
L T P C 3 0 0 3

OBJECTIVES:
- This course will give an appreciation of the fundamental principles, design and operation of hydraulic and pneumatic machines, components and systems and their application in recent automation revolution.

UNIT I  FLUID POWER PRINCIPLES AND FUNDAMENTALS (REVIEW)  
Introduction to Fluid power- Advantages and Applications- Fluid power systems – Types of fluids-

UNIT II  HYDRAULIC SYSTEM AND COMPONENTS  

UNIT III HYDRAULIC CIRCUITS
Industrial hydraulic circuits- Regenerative, Pump Unloading, Double-pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-safe, Speed control, Hydrostatic transmission, Accumulators, Electro hydraulic circuits, Mechanical Hydraulic servo systems.

UNIT IV PNEUMATIC SYSTEM
Compressors- Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust valves, Pneumatic actuators, Servo systems. Introduction to Fluidics, Pneumatic logic circuits.

UNIT V DESIGN OF HYDRAULIC AND PNEUMATIC CIRCUITS

TOTAL: 45 PERIODS

OUTCOMES:
• Identify hydraulic and pneumatics components.
• Ability to design hydraulic and pneumatics circuits.

TEXT BOOK

REFERENCES

MF6505 CNC MACHINING TECHNOLOGY

OBJECTIVES:
Upon completion of this subject, student will be able to:
• Understand evolution and principle of CNC machine tools
• Describe constructional features of CNC machine tools
• Explain drives and positional transducers used in CNC machine tools
• Write simple programs for CNC turning and machining centres
• Generate CNC programs for popular CNC controllers
• Describe tooling and work holding devices for CNC machine tools

UNIT I INTRODUCTION TO CNC MACHINE TOOLS
Evolution of CNC Technology, principles, features, advantages, applications,CNC and DNC concept, classification of CNC Machines – turning centre, machining centre, grinding machine, EDM, types of control systems, CNC controllers, characteristics, interpolators– Computer Aided Inspection
UNIT II  STRUCTURE OF CNC MACHINE TOOL
CNC Machine building, structural details, configuration and design, guide ways – Friction, Anti friction and other types of guide ways, elements used to convert the rotary motion to a linear motion – Screw and nut, recirculating ball screw, planetary roller screw, recirculating roller screw, rack and pinion, spindle assembly, torque transmission elements – gears, timing belts, flexible couplings, Bearings.

UNIT III  DRIVES AND CONTROLS

UNIT IV  CNC PROGRAMMING
Coordinate system, structure of a part program, G & M Codes, tool length compensation, cutter radius and tool nose radius compensation, do loops, subroutines, canned cycles, mirror image, parametric programming, machining cycles, programming for machining centre and turning centre for well known controllers such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAM packages.

UNIT V  TOOLING AND WORK HOLDING DEVICES
Introduction to cutting tool materials – Carbides, Ceramics, CBN, PCD–inserts classification- PMK, NSH, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices for rotating and fixed work parts, economics of CNC, maintenance of CNC machines.

TOTAL : 45 PERIODS

OUTCOMES
• Upon completion of this course the students can able to understand evolution and principle of CNC machine tools and describe constructional features of CNC machine tools

TEXT BOOKS

REFERENCES

MF6511  METROLOGY LABORATORY

OBJECTIVES:
• To make the students understand the fundamental principles of measuring techniques by practicing exercises on various measuring instruments.
LIST OF EXPERIMENTS:
Contact methods:
i) Linear and Angular measurement using Autocollimator.
ii) Measurement of composite error using gear tester.
iii) Calibration of optical comparator and measurement of dimension
iv) Determining the accuracy of electrical and optical comparator.
v) Measurement of taper angle using sine bar.
vi) Measurement of various angles using Bevel Protractor.
vii) Surface assessment using contact roughness tester.

Non-contact measurement techniques:
x) Experiments in CMM.

TOTAL: 30 PERIODS

OUTCOMES:
• Ability to use different metrological equipments and measure different parameters for quality impartion
• Use of the metrological equipments for quality control

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
Autocollimator, Gear Tester, Optical Comparator, Sine Bar, Bevel Protractor, Tool Makers Microscope, CMM, Contact roughness tester, Computers with necessary accessories.

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 24 PERIODS

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>HARDWARE</td>
<td></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</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>GB main memory) networked to the server</td>
<td></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>SOFTWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Any High end integrated modeling and manufacturing CAD</td>
<td>15 licenses</td>
</tr>
<tr>
<td></td>
<td>/ CAM software</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>CAM Software for machining centre and turning centre</td>
<td>15 licenses</td>
</tr>
<tr>
<td></td>
<td>(CNC Programming and tool path simulation for FANUC /</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sinumeric and Heidenhain controller)</td>
<td></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>
MF6512  MACHINE DRAWING  L T P C  0 0 4 2

OBJECTIVES:
• To train the students to prepare good and accurate drawing of various machine elements and assembly drawing of selected machine tool parts.

FUNDAMENTALS OF MACHINE DRAWING  8
Code of practice for Machine Drawing – Conventions, Abbreviation and Symbols
Sectional views – Types of sectional views
Selection of Fits and Tolerances – Method of placing limit dimensions.

BASIC MACHINE ELEMENTS  24
The required sectional view of the following machine elements are to be drawn as per the standards.
- Threaded joints
- Riveted joints
- Welded joints
- Key, Cotter and Pin joints
- Shaft coupling
- Bearing
- Pipe joints
- Gears
- Surface finish and its representation

ASSEMBLY DRAWING  28
The assembly drawing of the following machine tool parts is to be drawn from the given detailed drawing.
- Screw jack, machine vice, swivel bearing
- Lathe tailstock, Lathe tool post – Tool head of a shaper
- Drilling jig – Drilling machine spindle
- Engine piston and connecting rod
- Recirculating ball screw, LM guide ways,
- Hydraulic and Pneumatic chuck of CNC machine.

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to develop engineering drawing for the industrial components using India Standard Code of Practice.

TEXT BOOK:

REFERENCES:

MG6091  INDUSTRIAL MANAGEMENT  L T P C  3 0 0 3

OBJECTIVES:
• To provide an opportunity to learn basic management concepts essential for business..

UNIT I  INTRODUCTION  9
operative Enterprises – Public Sector Undertakings, Corporate Frame Work – Share Holders – Board of Directors – Committees – Chief Executive – Trade Union.

UNIT II FUNCTIONS OF MANAGEMENT

UNIT III ORGANIZATIONAL BEHAVIOUR

UNIT IV GROUP DYNAMICS

UNIT V MODERN CONCEPTS

TOTAL : 45 PERIODS

OUTCOMES:
• Students gain knowledge on the basic management principles to become management (s) professional.

TEXT BOOKS

REFERENCES:
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:

UNIT II JIGS AND FIXTURES
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

UNIT IV BENDING AND DRAWING DIES

UNIT V OTHER FORMING TECHNIQUES
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.

TOTAL: 45 PERIODS

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

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

TEXT BOOKS:

REFERENCES:
MF6601 COMPUTER INTEGRATED PRODUCTION MANAGEMENT SYSTEM

OBJECTIVES:
- The course provides basic concepts of production planning and control, its bottlenecks, material requirement planning, shop floor control and different approaches to computer aided process planning in manufacturing sector.

UNIT I PRODUCTION PLANNING AND CONTROL 10

UNIT II MATERIAL REQUIREMENT PLANNING 10

UNIT III SHOP FLOOR CONTROL 7
Functions of shop floor control – order scheduling – order progress – Data logging and acquisition – Automated data collection – Control types – Sensor Technology.

UNIT IV COMPUTER AIDED PROCESS PLANNING 8

UNIT V APPROACHES TO CAPP 10

TOTAL : 45 PERIODS

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 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

Historical Background – Mathematical Modeling of field problems in Engineering – Governing
Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems–
Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz
Technique – Basic concepts of the Finite Element Method.

UNIT II            ONE-DIMENSIONAL PROBLEMS

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher
order Elements – Derivation of Shape functions and Stiffness matrices and force vectors-
Assembly of Matrices - Solution of problems from solid mechanics and heat transfer. Longitudinal
vibration frequencies and mode shapes. Fourth Order Beam Equation – Transverse deflections
and Natural frequencies of beams.

UNIT III         TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation –Finite
Element formulation – Triangular elements – Shape functions and element matrices and vectors.
Application to Field Problems - Thermal problems – Torsion of Non circular shafts – Quadrilateral
elements – Higher Order Elements.

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

Natural co-ordinate systems – Isoparametric elements – Shape functions for iso parametric
elements – One and two dimensions – Serendipity elements – Numerical integration and
application to plane stress problems - Matrix solution techniques – Solutions Techniques to
Dynamic problems – Introduction to Analysis Software.

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 BOOKS:

   2005
   Delhi, 2007.

REFERENCES:

EE6502 MICROPROCESSORS AND MICROCONTROLLERS

OBJECTIVES

- To study the Architecture of uP8085 & uC 8051
- To study the addressing modes & instruction set of 8085 & 8051.
- To introduce the need & use of Interrupt structure 8085 & 8051.
- To develop skill in simple applications development with programming 8085 & 8051
- To introduce commonly used peripheral / interfacing

UNIT I 8085 PROCESSOR

UNIT II PROGRAMMING OF 8085 PROCESSOR
Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER

UNIT IV PERIPHERAL INTERFACING
Study on need, Architecture, configuration and interfacing, with ICs: 8255 , 8259 , 8254,8237,8251, 8279 , - A/D and D/A converters & Interfacing with 8085& 8051

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES

- Ability to understand and analyse, linear and digital electronic circuits.
- To understand and apply computing platform and software for engineering problems.

TEXT BOOKS

REFERENCES:
EE6612 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

OBJECTIVES:
1. Simple arithmetic operations: addition / subtraction / multiplication / division.
2. Programming with control instructions:
   (i) Ascending / Descending order, Maximum / Minimum of numbers
   (ii) Programs using Rotate instructions
   (iii) Hex / ASCII / BCD code conversions.
3. Interface Experiments: with 8085
   (i) A/D Interfacing & D/A Interfacing.
4. Traffic light controller.
5. I/O Port / Serial communication
6. Programming Practices with Simulators/Emulators/open source
7. Read a key, interface display
8. Demonstration of basic instructions with 8051 Micro controller execution, including:
   (i) Conditional jumps, looping
   (ii) Calling subroutines.
9. Programming I/O Port 8051
   (i) study on interface with A/D & D/A
   (ii) study on interface with DC & AC motor.
10. Mini project development with processors.

TOTAL: 45 PERIODS

OUTCOMES
- Ability to understand and analyse, linear and digital electronic circuits.
- To understand and apply computing platform and software for engineering problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>8085 Microprocessor Trainer with Power Supply</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>8051 Micro Controller Trainer Kit with power supply</td>
<td>15</td>
</tr>
<tr>
<td>3.</td>
<td>8255 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>8251 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>8259 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>8279 Keyboard / Display Interface board</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>8254 timer counter</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>ADC and DAC card</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>AC &amp; DC motor with Controller</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>Traffic Light Control System</td>
<td>5</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To provide practical knowledge in Advanced machine tools

LIST OF EXPERIMENTS:

Simple exercises using the following machines:
1. CNC Wire cut EDM
2. CNC Precision surface grinding machine
3. Rapid Prototyping machine
4. CNC Machining centre (Computer Aided Part Programming)
5. CNC Turning centre (Computer Aided Part Programming)

Study on following machines:
1. CNC Micro machining of 3D parts
2. CNC Laser engraving machine
3. Super finishing machine (Lapping and Honing)
4. Ultrasonic welding machine

TOTAL: 60 PERIODS

OUTCOMES:

- At the end of the course the students will be able to understand principle of working of advanced machine tools.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

CNC Machining centre, CNC Turning centre, CNC Wire cut EDM, CNC Precision surface grinding machine, Rapid Prototyping machine, Computers with necessary accessories

OBJECTIVES:

To enable learners to,

- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

UNIT I LISTENING AND SPEAKING SKILLS

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

UNIT II READING AND WRITING SKILLS

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

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS

International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service(Language related)- Verbal Ability.
UNIT IV  INTERVIEW SKILLS
Different types of Interview format- answering questions- offering information- mock interviews- body language( paralinguistic features)- articulation of sounds- intonation.

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

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><strong>Server</strong></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><strong>Client Systems</strong></td>
<td>60 Nos.</td>
</tr>
<tr>
<td></td>
<td>• PIII or above</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>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Television 46”</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Collar mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Cordless mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

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

External: 80 marks
Online Test - 35 marks
Interview - 15 marks
Presentation - 15 marks
Group Discussion - 15 marks
Note on Internal and External Evaluation:
1. Interview – mock interview can be conducted on one-on-one basis.
2. Speaking – example for role play:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephonic conversation- fixing an official appointment / placing an order / enquiring and so on.
3. Presentation – should be extempore on simple topics.
4. Discussion – topics of different kinds; general topics, and case studies.

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

REFERENCES:
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
4. Interactive Multimedia Programs on Managing Time and Stress.

Web Sources:
http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writing-job-applications
http://www.kent.ac.uk/careers/cv/coveringletters.htm
http://www.mindtools.com/pages/article/newCDV_34.htm

ME6015 OPERATIONS RESEARCH L T P C
3 0 0 3

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

UNIT I LINEAR MODELS

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS

UNIT III INVENTORY MODELS
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.
UNIT IV  QUEUEING MODELS
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V  DECISION MODELS

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

TEXT BOOK:

REFERENCES:

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

UNIT II  8085 MICROPROCESSOR AND 8051 MICROCONTROLLER
Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes – Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller – Block diagram.,

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  
8

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:

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
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
Public awareness.

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT  6

TOTAL : 45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters
TEXT BOOKS:

REFERENCES:

MF6701 FLEXIBLE MANUFACTURING SYSTEMS

OBJECTIVE:
At the end of this course the student should be able to understand
- Modern manufacturing systems
- To understand the concepts and applications of flexible manufacturing systems

UNIT I PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS
Introduction to FMS—development of manufacturing systems—a benefits—major elements—types of flexibility—FMS application and flexibility—single product, single batch, n–batch scheduling problem—knowledge based scheduling system.

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS
Introduction—composition of FMS—hierarchy of computer control—computer control of work center and assembly lines—FMS supervisory computer control—types of software specification and selection—trends.

UNIT III FMS SIMULATION AND DATA BASE

UNIT IV GROUP TECHNOLOGY AND JUSTIFICATION OF FMS
Introduction—matrix formulation—mathematical programming formulation—graph formulation—knowledge based system for group technology—economic justification of FMS—application of possibility distributions in FMS systems justification.

UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE
FMS application in machining, sheet metal fabrication, prismatic component production—aerospace application—FMS development towards factories of the future—artificial intelligence and expert systems in FMS—design philosophy and characteristics for future.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to perform Planning, Scheduling and control of Flexible Manufacturing systems
- Perform simulation on software’s use of group technology to product classification

TEXT BOOK
REFERENCES:

MF6711 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY

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

LIST OF EXPERIMENTS:

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

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

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

TEXT BOOKS:

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS
MF6712 DESIGN AND FABRICATION PROJECT

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

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

TOTAL : 60 PERIODS

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

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</td>
<td>2 No</td>
</tr>
</tbody>
</table>
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

Estimation of Different Types of Jobs - Estimation of Forging Shop , Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V

MACHINING TIME CALCULATION

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 BOOK:


REFERENCES:


OBJECTIVES:

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

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

TOTAL: 180 PERIODS

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

MA6459 NUMERICAL METHODS

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

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 10+3

UNIT II INTERPOLATION AND APPROXIMATION 8+3
Interpolation with unequal intervals - Lagrange’s interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3
Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Romberg’s method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson’s 1/3 rules.

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

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3
Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

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

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

TEXT BOOKS:

REFERENCES

GE6075 PROFESSIONAL ETHICS IN ENGINEERING

OBJECTIVES:
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instil Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I  HUMAN VALUES

UNIT II  ENGINEERING ETHICS

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

UNIT IV  SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V  GLOBAL ISSUES

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.
TEXT BOOKS:

REFERENCES:

Web sources:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

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 8
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 9
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 12
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-functiona-lization and applications-Quantum wires, Quantum dots-preparation, properties and applications

UNIT IV  CHARACTERIZATION TECHNIQUES 9
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

UNIT V APPLICATIONS

TOTAL : 45 PERIODS

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

TEXT BOOKS

REFERENCES

MF6001 PACKAGING MATERIALS AND TECHNOLOGY

OBJECTIVES:
- To study the fundamentals of packaging, manufacturing process, packaging materials and package testing.

UNIT I FUNDAMENTALS OF PACKAGING
Definition, functions of packaging, types and selection of package, Packaging hazards, interaction of package and contents, materials and machine interface, Environmental and recycling considerations - life cycle assessment
Package Design - Fundamentals, factors influencing design, stages in package development, graphic design, Structural design – simulation softwares

UNIT II PACKAGING MATERIALS
Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polysters, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Naphthalate (PEN), Nanomaterials, biodegradable materials – properties and applications, recycling; Wood, Paper, Textile, Glass, Metals - Tin, Steel, aluminum, Labelling materials, Cushioning Materials – properties and areas of application.

UNIT III CONVERSION TECHNOLOGY
Extrusion – Blown film, cast film, sheet, multilayer film & sheet, Lamination, Injection moulding, Blow moulding, Thermoforming; Cartoning Machinery, Bottling, Can former, Form Fill and Seal machines, Corrugated box manufacturing machineries, Drums – types of drums, moulded pulp containers, Closures, Application of Robotics in packaging,
Surface treatment for printing, Printing processes – offset, flexo, gravure and pad printing
UNIT IV SPECIALITY PACKAGING
Aerosol packaging, Shrink and Stretch wrapping, Blister packaging, Anti-static packaging, Aseptic packaging, Active packaging, Modified Atmospheric Packaging, Ovenable package; Cosmetic packaging, Hardware packaging, Textile packaging, Food packaging; Child resistant and Health care packaging, Export packaging, Lidding, RFID in packaging.

UNIT V TESTING

TOTAL : 45 PERIODS

OUTCOMES
- Ability to effectively use diffuse packing materials.
- Ability to test packaging materials.

TEXT BOOKS

REFERENCES:

GE6083 DISASTER MANAGEMENT

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

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

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

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:
The students will be able to

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

TEXTBOOK:

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

UNIT II GAME PLAYING
Overview – Minimax search procedure – Adding Alpha – Beta cutoffs – Waiting for Quiescence – Secondary search

UNIT III KNOWLEDGE REPRESENTATION

UNIT IV KNOWLEDGE REPRESENTATION USING OTHER LOGIC

UNIT V STRUCTURAL REPRESENTATIONS OF KNOWLEDGE

TOTAL: 45 PERIODS

OUTCOMES
• Use of Artificial Intelligence and tools solve engineering problems.

TEXT BOOK:

REFERENCES:

MF6003 VALUE ENGINEERING AND REENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• To understand and analyse the theory and methodology of Value Engineering with the Guidelines, Perfora and Checklist for a systematic, step by step application of the technique to the current industrial problems.
• To provide the knowledge about Reengineering Principles, the various models and implementation method, which are adopted in the industries.

UNIT I FUNDMENTALS OF VALUE ENGINEERING
Value Types – How to add value job plan – Technique employed – who will do value engineering – Organizing the value engineering study – Benefits.

UNIT II STEP BY STEP APPLICATION OF JOB PLAN 10

UNIT III WORK SHEETS AND GUIDE LINES 9

UNIT IV REENGINEERING PRINCIPLES 10

UNIT V IMPLEMENTATION OF REENGINEERING 8

OUTCOMES
• Use of value engineering and reengineering to the current industrial problem
• Ability to use various models and methods to solve the industrial problem

TEXT BOOKS:
2. Del L.Younker, “Value Engineering” Marcel Dekker, Inc. 2003

REFERENCES:

MF6004 ELECTRONICS MANUFACTURING TECHNOLOGY L T P C 3 0 0 3

OBJECTIVES:
Upon the completion of the subject, student will be able to:
• Understand wafer preparation and PCB fabrication
• Know the types of Mounting Technologies and components for electronics assembly
• Appreciate SMT process in detail.
• Know various Defects, Inspection Equipments SMT assembly process.
• Learn repair, rework and quality aspects of Electronics assemblies.

UNIT I INTRODUCTION TO ELECTRONICS MANUFACTURING 8
History, definition, wafer preparation by growing, machining, and polishing, diffusion, microlithography, etching and cleaning, Printed circuit boards, types- single sided, double sided, multi layer and flexible printed circuit board, design, materials, manufacturing, inspection.

UNIT II COMPONENTS AND PACKAGING 9
Introduction to packaging, types-Through hole technology(THT) and Surface mount technology(SMT), Through hole components – axial, radial, multi leaded, odd form. Surface-mount components- active, passive. Interconnections - chip to lead interconnection, die bonding,
wire bonding, TAB, flip chip, chip on board, multi chip module, direct chip array module, leaded, leadless, area array and embedded packaging, miniaturization and trends.

UNIT III SURFACE MOUNT TECHNOLOGY PROCESS 12
Introduction to the SMT Process, SMT equipment and material handling systems, handling of components and assemblies - moisture sensitivity and ESD, safety and precautions needed, IPC and other standards, stencil printing process - solder paste material, storage and handling, stencils and squeegees, process parameters, quality control. Component placement - equipment type, flexibility, accuracy of placement, throughput, packaging of components for automated assembly, Cp and Cpk and process control. soldering - reflow process, process parameters, profile generation and control, solder joint metallurgy, adhesive, underfill and encapsulation process - applications, materials, storage and handling, process and parameters.

UNIT IV INSPECTION AND TESTING 9
Inspection techniques, equipment and principle - AOI, X-ray. Defects and Corrective action - stencil printing process, component placement process, reflow soldering process, underfill and encapsulation process, electrical testing of PCB assemblies - In circuit test, functional testing, fixtures and jigs.

UNIT V REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES 7
Repair tools, methods, rework criteria and process, thermo-mechanical effects and thermal management, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, reworkability, testing, reliability, and environment.

TOTAL: 45 PERIODS

OUTCOMES:
- Perform fabrication of PCBs and use of mounting technology for electronic assemblies.
- Perform quality inspection on the PCBs

TEXT BOOKS:

REFERENCES:

ML6403 POWDER METALLURGY

OBJECTIVES:
This course teaches powder preparation, characterization, compaction and sintering. This knowledge is essential to understand powder metallurgy applications in aerospace, automobile and machining materials.

UNIT I  POWDER MANUFACTURE AND CONDITIONING  12
Mechanical methods: Machine milling, ball milling, atomization, shotting. Chemical methods: condensation, thermal decomposition, carbonyl Reduction by gas-hydride, dehydride process, electro deposition, precipitation from aqueous solution and fused salts, hydrometallurgical method. Physical methods: Electrolysis and atomisation processes, types of equipment, factors affecting these processes, examples of powders produced by these methods, applications, powder conditioning, heat treatment, blending and mixing, types of equipment, types of mixing and blending, Self-propagating high-temperature synthesis (SHS), sol-gel synthesis - Nano powder production methods.

UNIT II  CHARACTERISTICS AND TESTING OF METAL POWDERS  8
Sampling, chemical composition purity, surface contamination etc. Particle size and its measurement, Principle and procedure of sieve analysis, microscopic analysis: sedimentation, elutriation, permeability. Adsorption methods and resistivity methods: particle shape, classifications, microstructure, specific surface area. apparent and tap density, green density, green strength, sintered compact density, porosity, shrinkage.

UNIT III  POWDER COMPACTION  7
Pressure less compaction: slip casting and slurry casting, pressure compaction- lubrication, single ended and double ended compaction, isostatic pressing, powder rolling, forging and extrusion, explosive compaction.

UNIT IV  SINTERING  8
Stage of sintering, property changes, mechanisms of sintering, liquid phase sintering and infiltration, activated sintering, hot pressing and Hot Isostatic Pressing (HIP), vacuum sintering, sintering furnaces-batch and continuous-sintering atmosphere, Finishing operations – sizing, coining, repressing and heat treatment, special sintering processes- microwave sintering, Spark plasma sintering, Field assisted sintering, Reactive sintering, sintering of nanostructured materials.

UNIT V  APPLICATIONS  10

OUTCOMES
• Upon completion of this course, the student will have knowledge about powder metallurgical material and their fabrication processes.

TEXT BOOKS:

REFERENCES:
MG6089       SUPPLY CHAIN MANAGEMENT              L   T   P   C
                                          3   0   0   3

OBJECTIVES:
• To provide an insight on the fundamentals of supply chain networks, tools and techniques.

UNIT I    INTRODUCTION               5
Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain -Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II    SUPPLY CHAIN NETWORK DESIGN  10

UNIT III    LOGISTICS IN SUPPLY CHAIN 10

UNIT IV    SOURCING AND COORDINATION IN SUPPLY CHAIN 10
Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V    SUPPLY CHAIN AND INFORMATION TECHNOLOGY 10
The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain –E-Business in supply chain.

TOTAL: 45 PERIODS

OUTCOMES:
• The student would understand the framework and scope of supply chain networks and functions.

TEXTBOOK :

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:

• To understand maintenance concepts
• To understand the modern practices in maintenance

UNIT I  MAINTENANCE CONCEPTS  9
Objectives and functions – Tero technology – Reliability Centered Maintenance (RCM) –
maintainability prediction – availability and system effectiveness – maintenance costs –
maintenance organization

UNIT II  MAINTENANCE MODELS  9
Minimal repair – maintenance types – balancing PM and breakdown maintenance- PM schedules:
deviations on both sides of target values – PM schedules: functional characteristics – replacement
models

UNIT III  TOTAL PRODUCTIVE MAINTENANCE  9
Zero breakdowns – Zero Defects and TPM – maximizing equipment effectiveness – autonomous
maintenance program – five pillars of TPM – TPM small group activities – TPM organization –
management decision – educational campaign – creation of organizations – establishment of basic
policies and goals – formation of master plan – TPM implementation

UNIT IV  MAINTENANCE LOGISTICS  9
Human factors in maintenance – maintenance manuals – maintenance staffing methods – queuing
applications – simulation – spare parts management – maintenance planning and scheduling

UNIT V  ONLINE MONITORING  9
Condition Monitoring Techniques – Vibration Monitoring, Signature Analysis – Wear Debris
Monitoring – Maintenance Management Information System - Expert systems – Corrosion
Monitoring and Control

TOTAL: 45 PERIODS

OUTCOMES
• Implementation the concept of total productive maintenance to the industries
• Effectively use the total productive maintenance for online monitoring of processes

TEXT BOOKS

REFERENCES:

MF6006  NEW AND RENEWABLE SOURCES OF ENERGY  L T P C
3  0  0  3

OBJECTIVES:
• The student expected to understand and analyze the pattern of renewable energy
resources Suggest methodologies / technologies for its utilization. Economics of the
utilization and environmental merits

UNIT I  SOLAR ENERGY  9

UNIT II WIND ENERGY 9

UNIT III BIO - ENERGY 9

UNIT IV OTEC, TIDAL, GEOTHERMAL AND HYDEL ENERGY 9

UNIT V NEW ENERGY SOURCES 9
Hydrogen, generation, storage, transport and utilisation, Applications: power generation, transport – Fuel cells – technologies, types – economics and the power generation

TOTAL:45 PERIODS

OUTCOMES
- Use of renewable source for energy conversion

TEXT BOOKS:

REFERENCES:
UNIT III  FORM DESIGN OF CASTINGS AND WELDMENTS  9
Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols.

UNIT IV  MECHANICAL ASSEMBLY  9
Selective assembly, deciding the number of groups, control of axial play, examples, grouped datum systems - different types, geometric analysis and applications - design features to facilitate automated assembly.

UNIT V  TRUE POSITION THEORY  9
Virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, examples. Operation sequence for typical shaft type of components. Preparation of process drawings for different operations, tolerance worksheets and centrality analysis, examples.

TOTAL : 45 PERIODS

OUTCOMES
- Perform designing of components considering manufacture ability
- Ability to design casting and weld structures.
- Ability to use principles of design for assembly

TEXT BOOKS :

REFERENCES :

GE6084  HUMAN RIGHTS  L T P C
3 0 0 3

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


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

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

TOTAL : 45 PERIODS

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

REFERENCES:

MF6008 NON DESTRUCTIVE TESTING

OBJECTIVES:
On completion of this course, the students are expected to be conversant with
• Principles of various NDT techniques
• The equipment required for the NDT
• The mechanism involved in there NDT techniques
• Applications of NDT and recent trends in NDT

UNIT I LIQUID PENETRANT AND MAGNETIC PARTICLE INSPECTION

UNIT II RADIOGRAPHY

UNIT III EDDY CURRENT INSPECTION

UNIT IV ULTRASONIC TESTING
Production of ultrasonic waves – Different types of waves – normal beam inspection – Angle beam inspection – thickness measurements – Applications.

UNIT V RECENT TECHNIQUES
Non destructive inspection– Instrumentation for non destructive testing – Principles of holography- Principle of acoustic emission – Applications of holographic techniques– advantages and limitations – Other techniques.

TOTAL : 45 PERIODS

OUTCOMES
• Ability to characterise using different non destructive testing materials
• Use of standard techniques to predict surface and subsurface cracks

TEXT BOOK
REFERENCES:

MF6009 RAPID PROTOTYPING

OBJECTIVES:
- Generating a good understanding of RP history, its development and applications. To expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

UNIT I INTRODUCTION

UNIT II LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS
Classification – Liquid based system - Stereolithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

UNIT III POWDER BASED RAPID PROTOTYPING SYSTEMS

UNIT IV MATERIALS FOR RAPID PROTOTYPING SYSTEMS

UNIT V REVERSE ENGINEERING and NEW TECHNOLOGIES
Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, other applications - Case study.

TOTAL : 45 PERIODS

OUTCOMES
- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields

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

TOTAL: 45 PERIODS

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:

MF6010 PROCESSING OF PLASTICS AND COMPOSITE MATERIALS

OBJECTIVES:
To impart sound knowledge in
- Types of plastics, their structure, properties and applications
- Processing, machinery and joining of plastics
- Processing of Polymer Matrix and Metal Matrix Composites and their applications.

UNIT I INTRODUCTION TO PLASTICS AND COMPOSITES

UNIT II PROCESSING OF PLASTICS

UNIT III MACHINING AND JOINING OF PLASTICS
General Machining properties of plastics – Machining Parameters and their effect – Joining of Plastics – Mechanical Fasteners – Thermal bonding – Press Fitting.

UNIT IV PROCESSING OF POLYMER MATRIX COMPOSITES

UNIT V PROCESSING OF METAL MATRIX COMPOSITES

TOTAL : 45 PERIODS

OUTCOMES
- Ability to identify suitable matrix and reinforcement materials to fabricate composite materials.
- Ability to fabricate PMC, MMC and CMC

TEXT BOOKS
# REFERENCES


## ME6014 COMPUTATIONAL FLUID DYNAMICS

**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


## UNIT II FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION


## UNIT III FINITE VOLUME METHOD FOR CONVECTION DIFFUSION

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


## UNIT V TURBULENCE MODELS AND MESH GENERATION


**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:

IE6011 PRODUCT DESIGN AND DEVELOPMENT

OBJECTIVES:
- The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

UNIT I INTRODUCTION

UNIT II CONCEPT GENERATION AND SELECTION

UNIT III PRODUCT ARCHITECTURE

UNIT IV INDUSTRIAL DESIGN

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 15


TOTAL: 45 PERIODS

OUTCOMES:
- The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

TEXT BOOK:

REFERENCES:

MF6011 COMPUTER SIMULATION L T P C
3 0 0 3

OBJECTIVES:
- To understand the importance and advantages of applying simulation techniques for solving various problems on discrete event systems.
- To teach various random number generation techniques, its use in simulation, tests and validity of random numbers etc. Development of simulation models, verification, validation and analysis. Introduction to various simulation languages and comparison

UNIT I INTRODUCTION 5
Concept of simulation – simulation as a decision making tool-Monte Carlo simulation.

UNIT II RANDOM NUMBERS/VARIATES 9
Pseudo random numbers – methods of generating random variates – random variates for uniform, normal, binominal, passion, exponential distributions.

UNIT III DESIGN OF SIMULATION EXPERIMENTS 15
Problem formulation – data collection and reduction – logic developments – initial conditions – run length, tabular method of simulation – development of models using higher level languages for systems like queuing, production, inventory and maintenance – output analysis and interpretation, validation.

UNIT IV DISCRETE SYSTEM SIMULATION LANGUAGES 8
Need for simulation language – Comparison of simulation languages: SIMSCRIPT, GASP, SIMULA, GPSS, PROMODEL, etc...

UNIT V CASE STUDIES USING SIMULATION LANGUAGES 8
Development of simulation models using the simulation language studies for systems for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

OUTCOMES
• Ability to mathematical skills in simulation.
• Use of simulation languages such as SIMSCRIPT, GASP, SIMULa, GPSS, PROMODEL
• Perform simulation of system like queuing system, production systems, inventory system etc.,

TEXT BOOK

REFERENCES

MF6012 MICROMACHINING PROCESSES

OBJECTIVES:
Upon completion of this subject, student will be able to:
• Understand principle of microsystems and feed back systems
• Know the different methods of microfabrication.
• Understand the properties and microstructure of materials
• Appreciate Integration processes in detail
• Enhance his knowledge in semiconductor manufacturing processes.

UNIT I INTRODUCTION
Introduction to Micro System design, Material properties, micro fabrication technologies. Structural behavior, sensing methods, micro scale transport - feed back systems.

UNIT II MICROMECHANICS
Microstructure of materials, its connection to molecular structure and its consequences on macroscopic properties – Phase transformations in crystalline solids including martensite, ferroelectric, and diffusional phase transformations, twinning and domain patterns, smart materials

UNIT III BASIC MICRO-FABRICATION

UNIT IV MECHANICAL MICROMACHINING

UNIT V SEMI CONDUCTORS MANUFACTURING

OUTCOMES
- Ability to fabricate semiconductor devices using micro machining techniques
- Ability to design micro systems and know different micro fabrication system.

TEXT BOOK

REFERENCES:

ME6010 ROBOTICS
L T P C 3 0 0 3

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

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

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

UNIT III  SENSORS AND MACHINE VISION

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

UNIT V  IMPLEMENTATION AND ROBOT ECONOMICS

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:

MF6013 MECHANICAL VIBRATIONS AND NOISE L T P C 3 0 0 3

OBJECTIVES:
- To understand the fundamental knowledge on vibrating systems.
- To understand how to model the physical vibrating systems mathematically and the basic behavior of vibration measuring instruments and their industrial applications.
- To understand the fundamental of noise and its control.

UNIT I INTRODUCTION 8

UNIT II TWO DEGREE OF FREEDOM SYSTEMS 8

UNIT III MULTI DEGREE OF FREEDOM SYSTEMS 10

UNIT IV VIBRATION MEASUREMENT 10

UNIT V  FUNDAMENTALS OF NOISE  9

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to use mathematical knowledge to define vibration systems, perform vibration using different testing equipment
- Ability to measure noise and control them using methods.

TEXT BOOKS:

REFERENCES: