ANNA UNIVERSITY
CHENNAI - 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS 2012

CURRICULA AND SYLLABI FOR
I TO VIII SEMESTERS

B.E. MANUFACTURING ENGINEERING
(FULL TIME)
ANNA UNIVERSITY, CHENNAI 600 025
UNIVERSITY DEPARTMENT
R - 2012
B.E.- MANUFACTURING ENGINEERING
I - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

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OBJECTIVES

• To enable all students of engineering and technology develop their basic communication skills in English.
• To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
• To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
• To inculcate the habit of reading for pleasure.

UNIT I

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

UNIT II

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

UNIT III

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

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

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

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

TOTAL: 60 Periods

TEXT BOOKS:

REFERENCE BOOKS:


EXTENSIVE READERS

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

MA8151 MATHEMATICS – I
(Common to all branches of B.E. / B.Tech. Programmes in I Semester) 3 1 0 4

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

9+3


UNIT II INFINITE SERIES

9+3


UNIT III FUNCTIONS OF SEVERAL VARIABLES

9+3


UNIT IV IMPROPER INTEGRALS

9+3


UNIT V MULTIPLE INTEGRALS

9+3


TOTAL: 60 PERIODS

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

TEXT BOOKS:

REFERENCES:

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<th>ENGINEERING PHYSICS</th>
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**OBJECTIVE:**
To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

**UNIT I  PROPERTIES OF MATTER**
9
Elasticity - Poisson’s ratio and relationship between moduli (qualitative) - Stress-strain diagram

**UNIT II  ACOUSTICS AND ULTRASONICS**
9

**UNIT III  THERMAL PHYSICS**
9

**UNIT IV  APPLIED OPTICS**
9
Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein’s coefficients - CO₂, Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode
based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

**UNIT V  SOLID STATE PHYSICS**

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

**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:**

**REFERENCES:**

**CY8151 ENGINEERING CHEMISTRY**

(Common to all branches of Engineering and Technology) 3 0 0 3

**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 acquaint the students with the basics of nano materials, their properties and applications.

**UNIT I  CHEMICAL THERMODYNAMICS**

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

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

UNIT III  KINETICS AND CATALYSIS


UNIT IV  PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT V  NANOCHEMISTRY


TOTAL: 45 PERIODS

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:


REFERENCE BOOKS:

2. K. K. Rohatgi-Mukherjee, “Fundamental of Photochemistry” New Age International (P)
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.

TOTAL : 45 PERIODS
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:

GE8152 ENGINEERING GRAPHICS L T P C
(Common to all branches of B.E./B.Tech. Programmes) 2 0 3 4

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

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING 14
Basic Geometrical constructions, Curves used in engineering practices Conics Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.
Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from
pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14
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 14
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 15
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

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

TOTAL: 75 PERIODS

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

PH8161 PHYSICS LABORATORY L T P C
(Common to all branches of B.E./B.Tech. Programmes) 0 0 2 1

OBJECTIVES:
- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.
1. Torsional pendulum Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending Determination of young’s modulus
3. Lee's disc  Determination of thermal conductivity of a bad conductor
4. Potentiometer  Determination of thermo e.m.f. of thermocouple
5. Air wedge  Determination of thickness of a thin sheet of paper
6. i. Optical fibre  Determination of Numerical Aperture and acceptance angle
   ii. Compact disc  Determination of width of the groove using laser
7. Acoustic grating  Determination of velocity of ultrasonic waves in liquids
8. Post office box  Determination of Band gap of a semiconductor
9. Spectrometer  Determination of wavelength using grating
10. Viscosity of liquids  Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL : 30 PERIODS

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.

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

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.

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

TOTAL: 30 PERIODS

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

GE8161 COMPUTER PRACTICES LABORATORY
(Common to all branches of B.E./B.Tech. Programmes)

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

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

TOTAL: 45 PERIODS
OBJECTIVE:
To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE 12

PLUMBING
- Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump – inlet.
- Laying pipe connection to the delivery side of a pump – outlet.
- Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
- Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

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

2. ELECTRICAL ENGINEERING PRACTICE 9

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

GROUP – B (MECHANICAL AND ELECTRONICS) 15

3. MECHANICAL ENGINEERING PRACTICE

WELDING
- Arc welding of butt joints, lap joints, tee joints
- Gas welding Practice.
• Basic Machining
• Simple turning, drilling and tapping operations.
• Machine assembly Practice.
• Study and assembling the following:
  • Centrifugal pump, mixies and air conditioners.
  • Demonstration on
    (a) Smithy operations like the production of hexagonal bolt.
    (b) Foundry operation like mould preparation for grooved pulley.

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

TOTAL: 45 PERIODS

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.

HS8251 TECHNICAL ENGLISH II
(For all branches of B.E / B.Tech programmes)

OBJECTIVES
• To make the students acquire listening and speaking skills meant for both formal and informal contexts.
• To help them develop their reading skills by exposing them to different types of reading strategies.
• To equip them with writing skills needed for academic as well as workplace situations.
• To make them acquire language skills at their own pace by using e-materials and language lab component.

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TOTAL: 45 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.

TEXT BOOKS

REFERENCE BOOKS

EXTENSIVE READERS

WEB RESOURCES
1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
MA8251 MATHEMATICS II L T P C
(Common to all branches of B.E. / B.Tech. Programmes in II Semester ) 3 1 0 4

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

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

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

UNIT III ANALYTIC FUNCTION 9+3
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c, az, 1/z, z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3
UNIT V  LAPLACE TRANSFORMS  


TOTAL : 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:

PH8251 MATERIALS SCIENCE L T P C 3 0 0 3
(Common to Manufacturing, Industrial, Mining, Mechanical, Aeronautical, Automobile and Production Engineering)

OBJECTIVE:
- To introduce the essential principles of materials science for Mechanical and related Engineering applications.

UNIT I  MECHANICAL PROPERTIES  

Introduction to mechanical properties - tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep

UNIT II PHASE DIAGRAMS
Solid solutions - Hume Rothery’s rules - free energy of solid solution - intermediate phases - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the level rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - microstructural change during cooling.

UNIT III FERROUS ALLOYS AND HEAT TREATMENT

UNIT IV ELECTRONIC MATERIALS
Classification of solids - energy bands - concept of Fermi level - conductor, semiconductor, insulator - Semiconductors: intrinsic, extrinsic - carrier concentration expression (qualitative) - compound semiconductors (qualitative) - dielectric materials - polarization mechanisms - dielectric breakdown - magnetic materials - ferromagnetic materials & hysteresis - ferrites - superconducting materials, properties, types and applications.

UNIT V NEW MATERIALS AND APPLICATIONS

TOTAL : 45 PERIODS

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

TEXT BOOKS:
REFERENCE BOOKS:

GE8251  ENGINEERING MECHANICS   L T P C
               3 1 0 4

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

UNIT I  BASICS AND STATICS OF PARTICLES   12
Introduction – Units and Dimensions – Laws of Mechanics – Lami’s theorem, Parallelogram
and triangular Law of forces — Vectorial representation of forces – Vector operations of
forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular
components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in
space – Equivalent systems of forces – Principle of transmissibility .

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

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

UNIT IV  DYNAMICS OF PARTICLES      12
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear
Impact of elastic bodies.

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 \( \frac{\pi}{2} \)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:**


**ME8251 DESIGN CONCEPTS IN ENGINEERING L T P C 3 0 0 3**

**OBJECTIVES:**

- To impart the importance of design in today’s context of global competition, environmental awareness and customer oriented market.
- To impart the basic concepts and various aspects of design using simple examples and case studies.

**UNIT I DESIGN TERMINOLOGY 9**

Definition- various methods and forms of design-importance of product design-static and dynamic products- various design projects-morphology of design-requirements of a good design-concurrent engineering-computer aided engineering-codes and standards-product and process cycles-bench marking.
UNIT II    DESIGN PROCESS  
Basic module in design process-scientific method and design method-Need identification, importance of definition of problem-structured problem, real life problem- gathering information-customer requirements- Quality Function Deployment (QFD)- product design specifications-generation of alternative solutions- Analysis and selection-Detail design and drawings-Prototype, modeling, simulation, testing and evaluation (Basics only)

UNIT III    CREATIVITY IN DESIGN  
Creativity and problem solving-vertical and lateral thinking-invention-psychological view, mental blocks-Creativity methods-brainstorming, synectics, force fitting methods, mind map, concept map-Theory of innovative problem solving (TRIZ) - conceptual decomposition-creating design concepts.

UNIT IV    HUMAN AND SOCIETAL ASPECTS  
Human factors in design, ergonomics, user friendly design-Aesthetics and visual aspects-environmental aspects-marketing aspects-team aspects-legal aspects-presentation aspects.

UNIT V    MATERIAL AND PROCESSES IN DESIGN  
Material selection for performance characteristics of materials-selection for new design-substitution for existing design-economics of materials-selection methods-recycling and material selection-types of manufacturing process, process systems- Design for manufacturability (DFM) - Design for assembly (DFA).

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend the steps in the new product design
- Understanding of customer equipments for new product and making specifications.
- Knowledge in the role of creativity in product design
- Ability to decide materials and processes in product development.

TEXT BOOK:

REFERENCES:
OBJECTIVE:

- To identify the necessity of “manufacturing” Define with examples the concept of manufacturing, Machine tools and machining. State with examples the main requirements for “machining” List the main classifications of the manufacturing processes with examples.

UNIT I FUNDAMENTALS OF METAL CUTTING


UNIT II MACHINE TOOLS AND PROCESSES FOR PRODUCING ROUND SHAPES

Turning parameters-lathes and Lathe operations- -Cutting screw threads-Boring and boring machines-Drilling and drills-Drilling machines-reaming and reamers-tapping and taps-Design considerations for drilling, reaming and tapping- Capstan and Turret lathe-single spindle and multi spindle automats-Swiss type and automatic screw machines.

UNIT III MACHINE TOOLS AND PROCESSES FOR PRODUCING VARIOUS SHAPES

Milling operations-Milling machines-Planning and shaping-Broaching and broaching machines-Sawing-filing and finishing-gear manufactured by machining.

UNIT IV ABRASIVE MACHINING AND FINISHING OPERATIONS

Abrasives - bonded abrasives – Grinding process- wheel gear grinding operations and machines - grinding fluids - Design Consideration for Grinding - finishing operations-deburring - economics of grinding and finishing operation.

UNIT V MODERN MACHINING

High speed machining-Ultra precision Machining and Hard turning-Ultrasonic machining-Abrasive jet machining-Abrasive flow machining-Water jet machining -Electro chemical machining-Electric discharge machining-Wire Electric discharge machining-. Electron beam machining-Laser beam Machining.

TOTAL: 45 PERIODS

OUTCOME:

At the end of this course

- This domain knowledge will increase their employability skills
- Use this knowledge to develop innovative ideas in the areas of machine building, work holding and tool holding methods.
- Encourages to involve in research in the area of machining
TEXT BOOKS:

REFERENCES:

ME8261 COMPUTER AIDED MACHINE DRAWING L T P C 0 0 3 2

OBJECTIVES:
• To make the students understand and interpret drawings of machine components so as to prepare assembly drawings both manually and using standard CAD packages.
• To familiarize the students with Indian Standards on drawing practices and standard components.

UNIT I DRAWING STANDARDS 3

UNIT II FITS AND TOLERANCE 3
Limits, Fits – Tolerancing of individual dimensions – Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & tolerancing.

UNIT III INTRODUCTION TO DRAFTING PACKAGE 6
Drawing, Editing, Dimensioning, Plotting Commands, Layering Concepts, Matching, Detailing, Detailed drawing, Basic principles of geometric dimensioning & tolerancing.

**TOTAL: 20% of classes for theory classes and 80% of classes for practice = 45 PERIODS**

**Note:** 50% of assembly drawings must be done manually and remaining 50% of assembly drawings must be done by using any 2D drafting package)

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

**TEXT BOOK:**

**REFERENCES:**

**OBJECTIVE:**
- To Study and practice the various operations that can be performed in lathe, shaping, drilling, milling etc. and to equip with the practical knowledge required in the core industries.
LIST OF EXPERIMENTS:
1. Machining, Measurement and Machining time estimations of:
2. Taper Turning
3. External Thread cutting
4. Internal Thread Cutting
5. Eccentric Turning
6. Knurling
7. Square Head Shaping
8. Hexagonal Head Shaping

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

MA8356 PROBABILITY AND STATISTICS
(L T P C) 3 1 0 4
(Branch specific course)

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

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

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

UNIT III TESTS OF SIGNIFICANCE 9+3
UNIT IV DESIGN OF EXPERIMENTS 9+3
Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design - Taguchi’s robust parameter 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: 60 PERIODS

OUTCOMES:
After successfully completing the course, students should be able to do the following:
- Use statistical methodology and tools in the engineering problem-solving process.
- Compute and interpret descriptive statistics using numerical and graphical techniques.
- Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
- Compute point estimation of parameters, explain sampling distributions, and understand the central limit theorem.

TEXT BOOKS:

REFERENCES:

CE8353 STRENGTH OF MATERIALS L T P C
3 0 0 3

OBJECTIVE:
- 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 Theorems 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  
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theory – Application of theories of failure.

TOTAL: 45 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:
OBJECTIVE:

- To provide knowledge in the basic concepts of Electronics Engineering including semiconductors, transistors, electronic devices, signal generators and digital electronics.

UNIT I

SEMICONDUCTORS AND RECTIFIERS

Classification of solids based on energy band theory, Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Half and Full wave rectifiers, Zener effect, Zener diode, Zener diode Characteristics, Zener diode as a regulator.

UNIT II

TRANSISTOR AND AMPLIFIERS

Bipolar junction transistors – CB, CE, CC configurations and characteristics, Biasing circuits – Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III

FET AND POWER ELECTRONIC DEVICES

FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV

SIGNAL GENERATORS AND LINEAR ICS


UNIT V

DIGITAL ELECTRONICS

Boolean algebra, Logic Gates, , Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

TOTAL:45 PERIODS

OUTCOMES:

- Upon Completion of this subject, the students can able to explain semiconductor, amplifier, electronic devices, signal generators and application of digital electronics.

TEXT BOOK:

REFERENCES:

EE8251  BASIC ELECTRICAL ENGINEERING AND MEASUREMENTS  L T P C
3 0 0 3

OBJECTIVES
To impart knowledge on
- Electric circuit laws
- Principle of Electrical Machines
- Various measuring instruments

UNIT I  ELECTRICAL CIRCUITS  9

UNIT II  ELECTRICAL MACHINES  9
Construction and Principle of operation DC machines- Characteristics of DC machines Construction and Principle of operation of single phase transformers, synchronous machines, three-phase and single-phase induction motors

UNIT III  MEASUREMENT AND INSTRUMENTATION  9
Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type wattmeters – Energy meter – Megger – Instrument transformers (CT & PT) –Wheatstone’s bridge for measurement of unknown resistance ,Maxwell’s bridge for unknown inductance and Schering Bridge for unknown capacitance

UNIT IV  TRANSDUCERS  9
Classification of transducers, strain, RTD, thermocouples, Piezo-electric transducer, LVDT, Turbine and electromagnetic flow meters, level transducers ultrasonic and fiber optic transducers, type of sensors, elastic sensors, viscosity, moisture and pH sensors, Digital transducers, vibrating wire instruments like load cells, stress meter, etc.

UNIT V  SIGNAL CONDITIONING AND DISPLAY  9
Instrumentation amplifiers- Filters- A/D and D/A converters - Multiplexing and data acquisition - LED, LCD and CRT displays.

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:

MF8301 CASTING AND WELDING TECHNOLOGY L T P C
3 0 0 3

OBJECTIVE:
- To study various casting and welding methods including advanced techniques, with emphasis on basic principles, limitations and application areas.

UNIT I INTRODUCTION OF CASTING 10
Patterns: Making - materials, types, allowances pattern making- Moulding: materials, equipment, sand preparation, testing and control - Cores and core making- Design considerations in casting, gating system - Melting furnaces- directional solidification in castings, Metallurgical aspects of Casting- Steps involved in casting.

UNIT II CASTING PROCESSES 8
Casting processes: Steps, Advantages, limitations and applications of Sand castings, pressure die casting, permanent mould casting, centrifugal casting, precision investment casting, shell Moulding, CO₂ Moulding, continuous casting, squeeze casting, Fettling and finishing, casting defects and Inspection.
UNIT III  INTRODUCTION TO WELDING


UNIT IV  WELDING PROCESSES


UNIT V  AUTOMATION OF WELDING AND CASTING


TOTAL: 45 PERIODS

OUTCOME:

At the end of this course the students are expected

- To produce useful research output in welding and casting.
- Use this knowledge in advancing the welding and casting process.
- Application of design knowledge to understand and to overcome defects in welding and casting.

TEXT BOOKS:


REFERENCES:

OBJECTIVE:

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

UNIT I ALLOYS AND PHASE DIAGRAMS


UNIT II HEAT TREATMENT


UNIT III FERROUS AND NON-FERROUS METALS

Effect of alloying additions on steel- $\alpha$ and $\beta$ stabilisers– stainless and tool steels – HSLA, Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys, special non-ferrous metals and alloys of low coefficient of the thermal expansion, high corrosion resistance, heat resistant etc.

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, PAM, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes) - Engineering Ceramics – Properties and applications of $\text{Al}_2\text{O}_3$, $\text{SiC}$, $\text{Si}_3\text{N}_4$, PSZ and SIALON – Composites-Classifications- Matrix and reinforcement Materials- Applications of Composites-Nano composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test Izod and charpy, fatigue and creep failure mechanisms.

TOTAL : 45 PERIODS
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 BOOK

REFERENCES

CE8362 STRENGTH OF MATERIALS LABORATORY

OBJECTIVE:
- To study the properties of materials when subjected to different types of loading.

LIST OF EXPERIMENTS
1. Tension test on mild steel rod
2. Double shear test on metal
3. Torsion test on mild steel rod
4. Impact test on metal specimen (Izod and Charpy)
5. Hardness test on metals (Rockwell and Brinell Hardness Tests)
6. Deflection test on metal beam
7. Compression test on helical spring
8. Deflection test on carriage spring

TOTAL: 45 PERIODS

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

REFERENCE
1. Relevant Indian Standards
OBJECTIVES:
- Students should be able to verify the principles studied in theory by performing experiments in the laboratory.
  1. Speed Control of DC Shunt Motor
  2. Load Test on DC Shunt Motor
  3. Study of starters
  4. Swinburne’s Test
  5. Load Test on DC Series Motor
  6. Load Test on three Phase Alternator
  7. Load Test on three Phase Induction Motor
  8. Wheatstone’s Bridge
  9. Load Test on single phase Induction Motor.
  10. Load test on Single Phase Transformer.

OUTCOMES
- Ability to perform speed characteristic of different electrical machine

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

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

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

REFERENCE BOOKS

CE8352 FLUID MECHANICS AND MACHINERY  L T P C 3 0 0 3

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, capillarity and surface tension. Flow characteristics – concept of control volume - application of control volume to continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 7

UNIT III DIMENSIONAL ANALYSIS 8
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS 12
UNIT V TURBINES

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCE:

ME8452 MECHANICS OF MACHINES

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

UNIT I KINEMATIC OF MECHANICS

UNIT II GEARS AND GEAR TRAINS

UNIT III FRICTION IN MACHINE ELEMENTS
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes – Friction in vehicle propulsion and braking.
UNIT IV  FORCE ANALYSIS


UNIT V  BALANCING AND VIBRATION


OUTCOMES:

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

TEXT BOOK:


REFERENCES:


STANDARDS:

ME8453 THERMODYNAMICS

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

UNIT II FIRST AND SECOND LAW OF THERMODYNAMICS

UNIT III HEAT ENGINES

UNIT IV GASES AND VAPOUR MIXTURES

UNIT V HEAT TRANSFER

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:

REFERENCE BOOKS:

MF8401 METAL FORMING AND POWDER METALLURGY L T P C 3 0 0 3

OBJECTIVE:
1. At the end of this course the student should be able to understand the principles, equipments to be used, applications, advantages, limitations and economics of various metal forming processes such as bulk forming, sheet metal, special forming and powder metallurgy forming.

UNIT I INTRODUCTION TO METAL FORMING
Mechanical behavior of materials – Elastic and plastic deformation - Classification of Forming Processes – Temperature in metal working: hot and cold working – Introduction to the theory of plastic deformation.

UNIT II THEORY AND PRACTICE OF BULK FORMING PROCESSES
Analysis of plastic deformation in forging, rolling, extrusion, rod/wire and tube drawing processes – Effect of friction, calculation of forces, work done, process parameters, equipments, defects and applications – Recent advances in forging, rolling, extrusion and drawing processes – Experimental techniques of evaluation of friction in metal forming – Economics of bulk forming processes.

UNIT III SHEET METAL FORMING PROCESSES

UNIT IV SPECIAL FORMING PROCESSES
UNIT V  POWDER METALLURGY
Overview of powder metallurgy techniques, advantages and their applications – Powder forging, rolling, extrusion and drawing – Secondary and finishing operations – Design considerations for powder metallurgy– Economics of powder metallurgy processes.

TOTAL: 45 PERIODS

OUTCOME:
• At the end of the course the student will be able to apply and compare different metal forming concepts in bulk forming and sheet metal forming process.

TEXT BOOKS:

REFERENCES:

MF8451 PROCESS PLANNING AND COST ESTIMATION  L T P C
3 0 0 3

OBJECTIVE:
• To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I  INTRODUCTION TO PROCESS PLANNING  10
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection - Production equipment and tooling selection.

UNIT II  PROCESS PLANNING ACTIVITIES  10
Process parameters calculation for various production processes-Selection jigs and fixtures-selection of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies.
UNIT III INTRODUCTION TO COST ESTIMATION 8

UNIT IV PRODUCT COST ESTIMATION 8

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

TOTAL: 45 PERIODS

OUTCOME:
At the end of this course the students are expected to use
- This domain knowledge will increase their employability skills
- Use this knowledge to develop process planning for new products and making cost estimation.
- Creating database for the future use

TEXT BOOK:

REFERENCES:

CE8361 FLUID MECHANICS AND MACHINERY LABORATORY L T P C 0 0 3 2

OBJECTIVE:
- Students should able to verify the principles studied in theory by performing the experiments in laboratory.

A. FLOW MEASUREMENT
1. Calibration of Rotometer
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Verification of Bernoulli’s Theorem

B. LOSSES IN PIPES
1. Determination of friction coefficient in pipes
2. Determination of losses due to bends, fittings and elbows

C. PUMPS
1. Characteristics of Centrifugal pumps
2. Characteristics of Gear pump
3. Characteristics of Submersible pump
4. Characteristics of Reciprocating pump

D. TURBINES
1. Characteristics of Pelton wheel turbine
2. Characteristics of Francis turbine

E. DETERMINATION OF METACENTRIC HEIGHT
1. Determination of Metacentric height

TOTAL: 45 PERIODS

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

REFERENCE BOOKS:

ME8461 MANUFACTURING TECHNOLOGY LABORATORY – II

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
5. Gear generation in shaping
6. Spline Broaching
7. Plain Surface grinding
8. Cylindrical grinding
9. Tool angle grinding with tool and Cutter Grinder
10. Measurement of cutting forces in Milling /Turning Process
11. 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

OBJECTIVE
- Students should able to verify the principles studied in theory by performing the experiments in laboratory.

LIST OF EXPERIMENTS
1. Specimen preparation for ferrous alloys
2. Micro structural examination of ferrous alloys
3. Specimen preparation for non ferrous alloys
4. Micro structural examination of non ferrous alloys
5. Magnetic particle inspection test
6. Liquid penetrant test
7. Fluorescent particle inspection test.
8. Ultrasonic flaw detection.

LIST OF EQUIPMENTS
1. Specimen polishing machine with different grade of abrasive sheet, etchant for ferrous and non ferrous material.
3. Ultrasonic flaw detection machine.
4. Liquid penetration test dye, dryer and cleaner equipment.
5. Magnetic particle testing machine.
6. Eddy current testing machine.

TOTAL: 30 PERIODS

OUTCOMES

- Upon completion of the course the student can able to characterise the metallurgical properties and non destructive evaluation of specimens.

ME8552 HYDRAULICS AND PNEUMATICS

OBJECTIVE:

- This course will give an appreciation of the fundamental principles, design and operation of hydraulic and pneumatic components and systems and their application in manufacturing and mechanical systems.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS


UNIT II HYDRAULIC ACTUATORS AND VALVES


UNIT III HYDRAULIC SYSTEMS

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

UNIT IV PNEUMATIC SYSTEMS

Properties of air– Perfect Gas Laws- Compressors- Filter, Regulator, Lubricator, Muffler, Air
control Valves, Quick Exhaust valves, Pneumatic actuators, Design of pneumatic circuit-cascade method- Electro pneumatic circuits, Introduction to Fluidics, Pneumatic logic circuits.

UNIT V       TROUBLE SHOOTING AND APPLICATIONS


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

TEXT BOOK:

REFERENCES:

ME8553       MACHINE DESIGN

OBJECTIVES:
• To familiarize the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components

UNIT I       STEADY 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

UNIT II SHAFTS, COUPLINGS, JOINTS AND BEARINGS

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, key ways and splines –Rigid and flexible couplings.
Threaded fasteners, Welded joints and riveted joints for structures, Sliding contact and rolling contact bearings (Simple problems)

UNIT III ENERGY STORING ELEMENTS AND ENGINE COMPONENTS

Various types of springs, optimization of helical springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT IV DESIGN FOR FLEXIBLE ELEMENTS

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

UNIT V SPUR GEARS, HELICAL GEARS AND GEAR BOXES

Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations.

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box for machine tool applications – Variable speed gear box.

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 successfully design machine components

TEXT BOOK:


REFERENCES:


STANDARDS:

MF8501 CNC TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:
• To Understand evolution and principle of CNC machine tools
• To Describe constructional features of CNC machine tools, drives and positional transducers used in CNC machine tools
• To Generate CNC programs for popular CNC controllers
• To Describe tooling and work holding devices for CNC machine tools

UNIT I INTRODUCTION TO CNC MACHINE TOOLS 6
Evolution of CNC Technology, principles, features, advantages, applications, CNC and DNC concept, types of control systems, CNC controllers, characteristics, interpolators, types of CNC Machines – turning centre, machining centre, grinding machine, EDM, Computer Aided Inspection,

UNIT II STRUCTURE OF CNC MACHINE TOOL 10
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-qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, Tool for complete machining system, work holding devices for rotating and fixed work parts, economics of CNC, maintenance of CNC machines.

OUTCOME:
At the end of this course
- This domain knowledge will increase their employability skills
- Use this knowledge to program CNC machines
- Use this knowledge to organize production using CNC machines

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCE BOOKS:

MF8502 METROLOGY AND COMPUTER AIDED INSPECTION L T P C 3 0 0 3

OBJECTIVE:
- 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, the procedure used to operate these instruments and applications of computers in metrology.

UNIT I BASIC CONCEPTS OF MEASUREMENTS 8
Need for measurement - Precision and Accuracy - Errors in Measurements - Causes– Types- Handling of measuring instruments- Maintenance of Instruments.

UNIT II LINEAR AND ANGULAR MEASUREMENTS 9

UNIT III FORM MEASUREMENTS 9
Measurement of Screw threads and gears - Radius measurement - Surface finish measurement - Straightness, Flatness and roundness measurements - Principles - Application – Computerized form measuring equipments.

UNIT IV LASER METROLOGY 10

UNIT V COMPUTER AIDED INSPECTION AND ADVANCES IN METROLOGY 9

TOTAL: 45 PERIODS

OUTCOME:
At the end of this course
The student will be able to:
- Understand various technical terms and perform measurement tasks accurately.
- Choose the right instrument and method of measurement for a particular application.
- Follow the right procedure for measurement of various components depending upon the applications.
TEXT BOOK:

REFERENCES:

ME8561 DYNAMICS LABORATORY

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
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.

**OUTCOME**
- Ability to demonstrate the principles of kinematics and dynamics of machinery
- Ability to use the measuring devices for dynamic testing.

**TOTAL: 45 PERIODS**

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**OBJECTIVES:**
- Concepts of CNC programming and simulation on CNC turning center, Machining center and CNC Wire EDM
- Robot and PLC programming Methods

**LIST OF EXPERIMENTS**

1. Study of different control systems and CNC codes.
2. Programming and simulation for turning, taper turning, circular interpolation, thread Cutting and facing peration.
3. Programming and simulation using Do-Loop and Sub-routine for CNC turning centre.
4. Programming and simulation for machining of internal surfaces in CNC turning centre
5. Programming and simulation for profile milling operation, circular interpolation
6. Programming and simulation for circular and rectangular pocket milling
7. Programming using canned cycles
8. CNC code generation using CAM software packages – Turning centre
9. CNC code generation using CAM software packages – Machining centre
10. Programming for CNC Wire cut EDM
12. Robot programming for Material handling applications
13. PLC ladder logic programming.

TOTAL: 30 PERIODS

OUTCOME:
At the end of this course
- The student will be able to use CNC machines for production
- Use this knowledge to program CNC machines
- Use this knowledge for Robot and PLC programming

MF8512 METROLOGY AND COMPUTER AIDED INSPECTION

OBJECTIVE:
- To make the students understand the fundamental principles of measuring techniques by practicing exercises on various measuring instruments.

LIST OF EXPERIMENTS:
1. Linear and Angular measurements using Autocollimator.
2. Measurement of tooth thickness using gear tooth Vernier calliper
3. Calibration of optical comparator and measurement of dimensions
4. Exercises in Digital Height Gauge.
7. Study Exercises in Video measuring system, Rolling gear tester, Surface Roughness Tester and CMMs.

TOTAL: 30 PERIODS

OUTCOME:
At the end of this course
The student will be able to:
- Understand various technical terms and perform measurement tasks accurately.
- Choose the right instrument and method of measurement for a particular application.
- Follow the right procedure for measurement of various components depending upon the applications.

ME8551 COMPUTER AIDED DESIGN

OBJECTIVE:
- To provide an overview of how computers are being used in 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 MODELLING

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves- Techniques for surface modelling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modelling techniques- CSG and B-rep

UNIT III  VISUAL REALISM


UNIT IV  ASSEMBLY OF PARTS

Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property calculations – mechanism simulation and interference checking.

UNIT V  CAD STANDARDS

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc.- 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 BOOK:

REFERENCES:

ME8652 INDUSTRIAL MANAGEMENT

OBJECTIVE:
• To develop modern concepts of Industrial Management
UNIT I  INTRODUCTION

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:

REFERENCE BOOKS:

ME8653 MECHATRONICS L T P C

OBJECTIVE:
• This syllabus is formed to impart knowledge for the students about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I INTRODUCTION 12

UNIT II 8085 MICROPROCESSOR 8

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE 10

UNIT IV PROGRAMMABLE LOGIC CONTROLLER 7
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
Types of Stepper and Servo motors – Construction – Working Principle – Advantages and

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:

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

OBJECTIVES:
- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations
2. Creating effective PPTs – presenting the visuals effectively
3. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD
8. Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

OUTCOME
• The students will have enough confidence to present themselves well using proper oral and written communication skills to any interview (or) discussion (or) presentation.

REFERENCE BOOKS

EXTENSIVE READERS

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

ME8661 MECHATRONICS LABORATORY

OBJECTIVE:
• To know the method of programming the microprocessor and also the design, modelling
& 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 ‘AUTOMATION STUDIO’ 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.

MF8561  CAD LABORATORY  L T P C
0 0 3 2

OBJECTIVE:
- To study the features of CAD modelling software.
- To expose the students to modern solid modelling packages (Solid works, Nastran and Patran ).

LIST OF EXPERIMENTS

1. SKETCHER
   Introduction- Basic sketch, Constraints – Geometry & Dimensional.
2. SOLID MODELING
   Extrude, Revolve, Sweep, Loft, Datum plane creation etc
3. SURFACE MODELING
   Extrude & Revolve surfacing, Advance surfacing technique – Ruled & Loft surfacing, Mesh of curves, Free form surfaces, Surface operations – trium, merge, intersect, etc.
4. FEATURE MANIPULATION 69
5. **ASSEMBLY**
Constraints, Patterns, Exploded views, Interference check, creating components from assembly, mass property calculations, BOM generations and assembly cut sections.

6. **DRAFTING**
Standard view, Sectional views and Detailing, BOM and Balloon creation.

**TOTAL: 30 PERIODS**

**OUTCOME**
- Students will become familiar with Computer Aided Design software’s.
- To apply appropriate command in modelling of real time engineering applications.

**MF8611 CREATIVE AND INNOVATIVE PROJECT L T P C 0 0 3 2**
The goal of this course is to help students to identify innovative projects that promotes and inhibit creativity to explore the variables that affect creativity and innovation. By the end of the period, students should be familiar with current thinking in their field, and able to apply the concepts to relevant research problems or practical applications.

The goal of this course is to drive them to learn concepts, models, frameworks, and tools that engineering graduates need in a world where creativity and innovation is fast becoming a pre-condition for competitive advantage. Each student will choose a nagging workplace problem or socially relevant problems that have been difficult for them to „solve.“ At the end of the semester, each or group of students have to submit a report for evaluation.

**ME8752 FINITE ELEMENT ANALYSIS L T P C 3 0 0 3**

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

**UNIT I INTRODUCTION**

**UNIT II ONE-DIMENSIONAL PROBLEMS**
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

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 AND ADVANCED TOPICS

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCE BOOKS:
OBJECTIVE:

- 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 MANUFACTURING PLANNING AND CONTROL 10

UNIT II FORECASTING 8

UNIT III MATERIAL REQUIREMENT PLANNING 10

UNIT IV COMPUTER AIDED PROCESS PLANNING 10

UNIT V SHOP FLOOR CONTROL 7

OUTCOME
At the end of this course the students are expected

- To familiarize the students with computer application in various activities of manufacturing, production and control system.
- To apply appropriate principles and strategies of planning and control, forecasting, material requirement planning, process planning concepts and shop floor control into computer integrated manufacturing system.
TEXT BOOKS:

REFERENCES:

MF8751 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 15

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS 8

UNIT III INVENTORY MODELS 6
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS 6
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 10

TOTAL: 45 PERIODS
OUTCOMES:
- Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

REFERENCE BOOKS

MF8711 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY L T P C 0 0 3 2

OBJECTIVE:
- Students should able to verify the principles studied in theory by performing experiments in the laboratory.

LIST OF EXPERIMENTS

A. SIMULATION
1. MATLAB basics, Dealing with matrices, Graphing- Functions of one variable and two variables.
2. Response of under damped single degree of freedom systems to initial excitations.
3. Response of single degree freedom to harmonic and pulse excitations.
4. Frequency response plots
5. Vibration controller design
7. Simulation of Hydraulic / Pneumatic cylinder
8. Simulation of cam and follower mechanism.
B. ANALYSIS

1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket
3. Stress analysis of an axi-symmetric component
4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2D component
8. Transient analysis of spring mass system
9. Thermal stress analysis of a 2D component
10. Conductive Heat transfer analysis of a 2D component
11. Convective Heat transfer analysis of a 2D component

TOTAL: 30 PERIODS

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

MF8712 INDUSTRIAL TRAINING L T P C 0 0 0 2

OBJECTIVE:
- The main objective of the Industrial Training is to experience and understand real life situations in industrial organizations and their related environments and accelerating the learning process of how student’s knowledge could be used in a realistic way.

DURATION:

The students have to undergo practical industrial training for four weeks (During Sixth Semester holidays) in recognized industrial establishments.

I. At the end of the training they have to submit a report with following information:
   1. Profile of the Industry
   2. Product range
   3. Organization structure
   4. Plant layout
   5. Processes/Machines/Equipment/devices
   6. Personnel welfare schemes
7. Details of the training undergone
8. Projects undertaken during the training, if any
9. Learning points.

II. End Semester examination will be a Viva-Voce Examination.

**OUTCOME:**
- At the end of the course the student will be able to understand the different forms of organization, functions of management, organizational behavior, group dynamics and modern concepts in industrial management.

**MF8811**

**PROJECT WORK**

**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.

A project topic must be selected by the students in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and fabrication of a device for a specific application, a research project with a focus on an application needed by the industry/society, a computer project, a management project or a design project.

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 jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

**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.

**MF8001**

**NANO COATING**

**OBJECTIVES:**
- To understand the basics of Nanostructured coatings.
- To understand about different coating methods and characterization of nanocoatings.
• To understand the properties change due to coatings and also the applications.

UNIT I  INTRODUCTION TO NANOSTRUCTURED COATING
Introduction of Nanotechnology – Production of Nanoparticles - Applications of Nanoparticles – Thin Films – Significance of Thin Films - Production of Thin Films – Applications of Thin films - Coating and Surface Engineering - Coating Issues and Applications

UNIT II  NANOSTRUCTURED COATINGS

UNIT III  CHARACTERISATION OF NANOCAOTINGS

UNIT IV  PROPERTIES OF NANOSTRUCTURED COATINGS

UNIT V  APPLICATIONS OF NANOCOATINGS
Surface Improvement for Making Fog and Vapor Resistant Layers - Self-Cleaning Glasses - Medical and Hygienic Applications - Food Packaging - Electrical and Electronic Applications - Lubricating Applications – Automobile industries – Defence applications.

TOTAL: 45 PERIODS

OUTCOMES
• Will familiarize about the science of nanocoatings
• Will demonstrate the preparation of nanocoatings
• Will develop knowledge in characteristic nanocoatings

TEXT BOOKS:
REFERENCE:

MF8002 NON DESTRUCTIVE EVALUATION L T P C 3 0 0 3

OBJECTIVE:
• To make students to understand various Non Destructive testing methods including advanced techniques, with emphasis on basic principles, limitations and application areas.

UNIT I INTRODUCTION 9
Visual methods: Optical aids, In-situ metallography, Optical holographic methods, Dynamic inspection.

UNIT II LIQUID PENETRANT & MAGNETIC INSPECTION 9

UNIT III RADIOGRAPHIC METHODS 9

UNIT IV ULTRASONIC TESTING OF MATERIALS 9
Advantages, disadvantages, Applications, Generation of. Ultrasonic waves, general characteristics of ultrasonic waves: methods and instruments for ultrasonic materials testing: special techniques.

UNIT V ELECTRICAL AND OTHER METHODS 9

TOTAL: 45 PERIODS

OUTCOME:
At the end of this course
The student will be able to:
• Choose the right method of testing for detection of defects on various materials.
• Will understand to operate advanced NDT instruments and equipments easily
• They will know the safety procedures of operating the NDT equipments and follow them.
• They will exploit the advantages of NDT in industrial applications for the benefit of the society.

TEXT BOOKS:

REFERENCES:

MF8003 PRECISION ENGINEERING L T P C

OBJECTIVE:
• To provide and enhance the technical knowledge in precision engineering, its components and applications.

UNIT I PRECISION ENGINEERING 8

UNIT II PRECISION MACHINE ELEMENT 9

UNIT III ERROR CONTROL 9

UNIT IV PRECISION MANUFACTURING 9
Micro machining processes-diamond machining - micro engraving - Micro replication techniques-forming-casting-injection moulding micro embossing - Energy assisted processes
- LBM, EBM, FIB, Micro electro discharge machining-photolithography-LIGA process- Silicon micro machining-Wet and dry etching-thin film deposition.

UNIT V  MEMS
Introduction – MEMS –characteristics- principle – Design – Application: automobile, defence, health care, Industrial, aerospace etc.,

TOTAL : 45 PERIODS

OUTCOME:
Students will:
- Operate high precision machineries with ease.
- Research and explore new areas of cutting tools.

TEXT BOOKS:

REFERENCE BOOKS:
2. Institute of Physics Publishing, Bristol and Philadelphia, Bristol, BSI 6BE U.K.

MF8004 PROCESSING OF PLASTICS AND COMPOSITE MATERIALS

OBJECTIVE:
The purpose of this subject is to equip the students with the knowledge of processes utilized in developing materials or making components using plastics and composite materials. This subject develops the competence of the students in major industrially practiced processing techniques.

UNIT I  INTRODUCTION TO PLASTICS AND COMPOSITE

UNIT II  PROCESSING OF PLASTICS
UNIT III PROCESSING OF POLYMER MATRIX COMPOSITES
Open Mould Processes, Bag Moulding, Compression Moulding with BMC and SMC - Filament winding - Pultrusion - Centrifugal Casting - Injection Moulding - Application of PMC’s.

UNIT IV PROCESSING OF METAL MATRIX COMPOSITES

UNIT V PROCESSING OF CERAMIC MATRIX COMPOSITES
Coldpressing and sintering-hot pressing-rection bonding processes-Liquid infiltration-Lanxide process-In situ chemical reaction techniques:chemical vapour infiltration-chemical vapour deposition-Reactive consolidation-sol-gel techniques-pyrolysis-self propogating high temperature synthesis-Electropherotic deposition.-Application of CMC’s.

OUTCOME:
• The students will be able to identify various processing methods used for different types of plastics used in our daily life.
• This subject induces the students to do project work in the area of composite materials.

TEXT BOOKS:

REFERENCES

PR8652 PRODUCTION OF AUTOMOTIVE COMPONENTS L T P C 3 0 0 3

OBJECTIVES:
• To impart knowledge in various manufacturing methods in developing automotive components.
• To study the principle of automobile engineering.
UNIT I  ENGINE  9
Working principle of two strokes, four stroke and wankel engines – wet and dry liners – Piston and Piston rings – types – classification. Production of – Cylinder block, Cylinder head, liners, oil pan, piston and piston rings and testing.

UNIT II  ENGINE PARTS  8
Working principle of crank shaft – Cam shaft – valve operating mechanisms – carburetors - spark plug Production of – Connecting rod – Crankshaft - push rod and rocker arm – valves – tappets – carburetors and spark plugs

UNIT III  FUEL AND TRANSMISSION SYSTEM  10

UNIT IV  CHASSIS AND SUSPENSION SYSTEM  8

UNIT V  RECENT ADVANCES  10

OUTCOME
- For a given automotive components the students will be able to select the proper sequence of manufacturing process and produce them.

TEXT BOOKS:

REFERENCES:
2. Newton and steels, the motor vehicle, ELBS, 1990
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
History of simulation - Concept – simulation as a decision making tool-Advantages of simulation, Disadvantages, Applications - Monte Carlo simulation-Simulators.

UNIT II RANDOM NUMBERS/VARIATES

UNIT III DESIGN OF SIMULATION EXPERIMENTS
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 queueing, production, inventory and maintenance – output analysis and interpretation, validation.

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

UNIT V QUEUING POLICIES, ALGORITHMS AND CASE STUDIES
Introduction to basic Single-pass heuristics, meta-heuristics and applications-Application of Genetic algorithms and Ant colony based algorithms in Discrete event simulation models with simple examples.
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.

TOTAL : 45 PERIODS

OUTCOME:
- The student will be able to understand industrial scenarios, involve in intelligent questioning sessions with experts to get clear insight about the problem and build an appropriate simulation model
- The students can understand the type of model to be built suiting to the industrial situation and choose right measures of performances for evaluation and analysis.
• They can justify their findings with statistical analysis and successfully compromise the management in implementing their proposed ideas and produce results.
• Students can easily understand simulation models developed in other simulation software and involve in expert suggestions to improvise the same.
• They can teach simulation situations through their own models and show the effects of altering them.

TEXT BOOK:

REFERENCE BOOKS:

WEB REFERENCE BOOKS:

MF8007 THEORY OF METAL CUTTING L T P C
3 0 0 3

OBJECTIVES:
• To learn tool nomenclature, mechanical of metal cutting and forces in metal cutting.
• To know the thermal aspects in machining, tool materials, tool life and wear mechanisms

UNIT I TOOL NOMENCLATURE 8
Single point tool-significance of the various angles provided and nose radius-American, German CIRP and orthogonal system of tool nomenclature, nomenclature of drills, milling cutters and broaches-grinding wheels, Need for chip breakers.

UNIT II MECHANICS OF METAL CUTTING 10
Mechanisms of formation of chips-types of chips and the conditions conducive for the formation of each type built- up edge, its effects orthogonal Vs oblique cutting-Merchant’s circle diagram-Force and Velocity relationship, shear plane angle, Energy considerations in matching-Ernst Mechant’s theory of shear angle relationship-original assumption and modifications made.

UNIT III FORCES IN MACHINING 9
Forces in turning, drilling, milling and grinding, conventional Vs climb milling-mean and maximum cross sectional areas of chip in milling-specific cutting pressure-specific horse power-requirements of tool dynamometers-construction and principle of operation of tool dynamometers for turning, drilling and milling
UNIT IV THERMAL ASPECTS IN MACHINING

Sources of heat generation in machining—temperature measurement techniques in machining, Functions of cutting fluid—characteristics of cutting fluid—types, modes of applications, additives—application of cutting fluids—dry machining, Minimum Quantity Lubrication (MQL) machining.

UNIT V TOOL MATERIALS, TOOL WEAR AND TOOL LIFE

Requirements of tool materials—advances in tool materials—HSS, coated HSS, carbides and coated carbides, ceramic, cold pressed, hot pressed, ceramic composites, CBN, PCD, properties, advantages and limitations—ISO specifications for inserts and tool holders, tool wear, type mechanisms, tool life, machinability, economics of machining, chatter in machining.

TOTAL: 45 PERIODS

OUTCOME:

At the end of this course

- The student will be able to understand various tool nomenclatures
- Use this knowledge to calculate forces in machining
- Use this knowledge for the selection of tools for various machining operations

TEXTBOOKS:


REFERENCES:


MF8008 VALUE ENGINEERING AND REENGINEERING L T P C 3 0 0 3

OBJECTIVES:

- To understand and analyze the theory and methodology of Value Engineering with the Guidelines, Performa 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 industry.

UNIT I FUNDAMENTALS OF VALUE ENGINEERING

Value Types – How to add value job plan – Technique employed - Selection of project and team members – Value Engineering Job Plan – Benefits - Audit

UNIT II VALUE ENGINEERING AND JOB PLAN

General and information phase – Function Classification, Fast diagram—Meaningful costs –

UNIT III REENGINEERING PRINCIPLES


UNIT IV REENGINEERING PROCESS IMPROVEMENT MODELS


UNIT V IMPLEMENTATION OF REENGINEERING


TOTAL: 45 PERIODS

OUTCOME:

- The student will be able to practice the principles of value manufacturing
- This domain knowledge will help them to systematically doing value analysis
- The students will understand Systematic starting over and reinventing the way a firm, or a business process

TEXT BOOKS:


REFERENCE BOOK:


MF8071 ADDITIVE MANUFACTURING TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturing technologies
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.
UNIT I    INTRODUCTION    10

UNIT II    CAD & REVERSE ENGINEERING    10

UNIT III    LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS    10
Classification – Liquid based system – Stereolithography Apparatus (SLA) - Principle, process, advantages and applications - Solid based system –Fused Deposition Modeling - Principle, process, advantages and applications, Laminated Object Manufacturing.

UNIT IV    POWDER BASED ADDITIVE MANUFACTURING SYSTEMS    10

UNIT V    MEDICAL AND BIO-ADDITIVE MANUFACTURING    5

TOTAL: 45 PERIODS

OUTCOME
- On completion of this course, students will learn about a working principle and construction of Additive Manufacturing technologies, their potential to support design and manufacturing, modern development in additive manufacturing process and case studies relevant to mass customized manufacturing.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

• To understand wafer preparation and PCB fabrication, the types of Mounting Technologies and components for electronics assembly & SMT process in detail.
• To know various Defects, Inspection Equipments SMT assembly process and 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:

REFERENCE BOOKS:

MF8073  FLEXIBLE MANUFACTURING SYSTEMS  L T P C
                                                  3 0 0 3

OBJECTIVES:
• To understand the Modern manufacturing systems
• To understand the concepts and applications of flexible manufacturing systems

UNIT I  PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE
         MANUFACTURING SYSTEMS  9
Introduction to FMS– development of manufacturing systems – 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
         MANUFACTURINGSYSTEMS  9
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  9
Application of simulation – model of FMS– simulation software – limitation – manufacturing

UNIT IV  GROUP TECHNOLOGY AND JUSTIFICATION OF FMS  9

UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE

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:

REFERENCE BOOKS:

MF8074 INDUSTRIAL 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
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCE BOOKS:
OBJECTIVES:
• To understand the mechanics, scaling and design of micro system
• To learn various micro fabrication processes
• To impart knowledge on microsystems packaging and metrology of micro machined components

UNIT I INTRODUCTION

UNIT II MECHANICS, SCALING AND DESIGN

UNIT III MICRO SYSTEM FABRICATION PROCESSES
Introduction- Photolithography- Ion implantation- Chemical Vapor deposition-Physical Vapor deposition - clean room- Bulk micromachining :etching, isotropic and anisotropic etching, wet and dry etching- Surface micro machining :process, mechanical problems associated with surface micro machining- LIGA process :general description, materials for substrates and photo resists-SLIGA process-Abrasive jet micro machining-Laser beam micro machining-Micro Electrical Discharge Micro Machining –Ultrasonic Micro Machining- Electro chemical spark micro machining- Electron beam micro machining-Focused Ion Beam machining

UNIT IV TOOL BASED MICROMACHINING

UNIT V MICROSYSTEMS PACKAGING AND METROLOGY OF MICRO MACHINED COMPONENTS

TOTAL : 45 PERIODS
OUTCOME:
At the end of this course
- The student will be able to understand various MEMS techniques
- Use this knowledge to design MEMS
- Use this knowledge to measure MEMS components

TEXT BOOKS:

REFERENCE BOOKS:

MF8076 NANOTECHNOLOGY

OBJECTIVES:
At the end of this course the students are expected to understand the general issues relating to nanotechnology and nanofabrication.
- Methods for production of Nanoparticles
- Characteristic techniques of Nanomaterials

UNIT I INTRODUCTION TO NANOMATERIALS

UNIT II SYNTHESIS OF NANOMATERIALS
UNIT III  CHARACTERISATION OF NANOMATERIALS

UNIT IV  APPLICATIONS OF NANOMATERIALS
Applications in Mechanical, Electronics engineering industries – Use of nanomaterials in automobiles, aerospace, defense and medical applications – Metallic, polymeric, organic and ceramic nanomaterials.

UNIT V  NANO FABRICATION AND MACHINING
LIGA, Ion beam etching, Molecular manufacturing techniques – Nano machining techniques – Top/Bottom up Nano fabrication techniques - Sub micron lithographic technique, conventional film growth technique, Chemical etching, Quantum materials.

OUTCOME:
At the end of this course
- The student will be able to produce nanomaterials using various techniques
- Use this knowledge to characterize nanomaterials
- Use this knowledge to fabricate nano-scaled products

TEXT BOOKS:

REFERENCES:

MF8077 PRODUCT DESIGN AND DEVELOPMENT

OBJECTIVE:
- To teach the students basic concepts of Product Design and Process Development.
- Expose the students to the importance, various stages, concepts, management and prototyping of Product Design and Process Development.
UNIT I  INTRODUCTION  9
Strategic importance of Product development - integration of customer, designer, material supplier and process planner, Competitor and customer - behavior analysis. Understanding customer-promoting customer understanding-involve customer in development and managing requirements - Organization process management and improvement.

UNIT II  CONCEPT GENERATION, SELECTION AND TESTING  9

UNIT III  PRODUCT ARCHITECTURE  9
Product development management - establishing the architecture - creation - clustering - geometric layout development - Fundamental and incidental interactions - related system level design issues - secondary systems -architecture of the chunks - creating detailed interface specifications-Portfolio Architecture.

UNIT IV  INDUSTRIAL DESIGN  9
Integrate process design - Managing costs - Robust design - Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically - Need for industrial design-impact – design process - investigation of customer needs - conceptualization - refinement - management of the industrial design process.

UNIT V  DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT  9
Definition - Estimation of Manufacturing cost-reducing the component costs and assembly costs – Minimize system complexity - Prototype basics - Principles of prototyping - Planning for prototypes - Economic Analysis.

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:
OBJECTIVES:
• Teach the essentiality of SQC, sampling and reliability engineering. Study on various types of control charts, six sigma and process capability to help the students understand various quality control techniques.
• Reliability engineering focuses on the dependability, failure mode analysis, reliability prediction and management of a system.

UNIT I  STATISTICAL QUALITY CONTROL
Methods and Philosophy of Statistical Process Control - Control Charts for Variables and Attributes - Cumulative sum and Exponentially weighted moving average control charts - Other SPC Techniques – Process - Capability Analysis - Six sigma concept.

UNIT II  ACCEPTANCE SAMPLING
Acceptance Sampling Problem - Single sampling plans for attributes – double sampling - multiple sampling - sequential sampling - Military standards - The Dodge Roming sampling plans – Random sampling

UNIT III  RELIABILITY ENGINEERING
Definition of reliability – Performance and reliability - Reliability requirements – System life cycle – Mean time between failures – Mean time to failure - Mortality Curve - Availability – Maintainability.

UNIT IV  FAILURE DATA ANALYSIS

UNIT V  RELIABILITY PREDICTION AND MANAGEMENT

OUTCOMES:
At the end of this course
The student will be able to:
• Know and apply various quality tools to tackle dynamic industrial situations.
• Give a quality index to an industrial situation following an engineering approach.
• Estimate process capability and take remedial actions at the right time to have the processes under control.
• Understand reliability, various modes of failures, maintenance, replacement of machineries and equipments at the right time and be instrumental in enriching the industrial culture with quality policy leading to higher productivity.

TEXT BOOKS:
REFERENCES:

MF8079 TOTAL PRODUCTIVE MAINTENANCE L T P C
3 0 0 3

OBJECTIVE:
- To teach the students basic concepts of Total Productive Maintenance. Expose the students to the objectives, maintenance models, group activities, logistics, condition monitoring and implementation of Total Productive Maintenance.

UNIT I MAINTENANCE CONCEPTS
Introduction - Objectives and functions – Productivity, Quality, Reliability and Maintainability (PQRM) - Terotechnology – Reliability Centered Maintenance - Predictive Maintenance - Condition Based Maintenance – maintainability prediction – availability and system effectiveness- maintenance costs – maintenance organization.

UNIT II MAINTENANCE MODELS
Minimal repair – As Good As New policy – 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

UNIT IV MAINTENANCE LOGISTICS

UNIT V ONLINE MONITORING

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:

MA8353  NUMERICAL METHODS  L T P C
3 1 0 4

OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9+3

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

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

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  
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

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:

MG8654  TOTAL QUALITY MANAGEMENT  
L T P C 3 0 0 3

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

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

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

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL : 45 PERIODS

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

TEXT BOOK:

REFERENCE BOOKS:
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:

ME8073 DESIGN FOR MANUFACTURING L T P C 3 0 0 3

OBJECTIVES:
• To understand the principles of design such that the manufacturing of the product is possible.
• To educate students on various design aspects to be considered for manufacturing the products using different processes.

UNIT I MANUFACTURING METHODOLOGY AND PROCESESS 9
Methodologies and tools, design axioms, design for assembly and evaluation, minimum part assessment, Taguchi method, robustness assessment, manufacturing process rules, designer’s tool kit, Computer Aided group Technology, failure mode effects analysis, Value Analysis, Design for minimum number of parts, development of modular design, minimizing part variations, design of parts to be multi-functional, multi-use, ease of fabrication, Poke Yoke principles.

UNIT II GEOMETRIC ANALYSIS 9
Surface finish, review of relationship between attainable tolerance grades and different machining processes, part features-feature of size-control from-placement material condition – MMC – LMC

UNIT III FORM DESIGN OF CASTINGS AND WELDMENTS 9
Redesign of castings based on parting line considerations, minimizing core requirements, redesigning cast members by welded structure , 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, Assembly analysis worst case Arithmetic method, Monte -Carlo method.
UNIT V  TRUE POSITION THEORY
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.

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:

REFERENCE BOOKS:
4. Trucks H.E. “Design for Economic Production”. Society of Manufacturing Engineers,

ME8074 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

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:
Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements –
principles of location – Locating methods and devices – Redundant Location – Principles of
clamping – Mechanical actuation – pneumatic and hydraulic actuation Standard parts – Drill
bushes and Jig buttons – Tolerances and materials used.

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 – Po ka 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 BOOK:

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

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

UNIT I ENTREPRENEURSHIP

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

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXTBOOKS:


REFERENCES:


PR8071 ELECTRONIC MATERIALS AND PROCESSING L T P C 3 0 0 3

OBJECTIVE:
• To introduce the technology behind electronic materials and processing and their applications.

UNIT I INTRODUCTION 9
Overview of semiconductors and other basic materials - Plastics, Elastomers, and Composites - tables with material properties, terms and definitions, trade names, and material structure correlation, Memes.

UNIT II ORGANIC MATERIALS AND PROCESSES 9
Types and properties of organic materials, manufacturing technique – Vacuum Metallization, Vapour phase deposition, Thermal Imaging, Digital Lithography, Application areas.

UNIT III MEMS MATERIALS AND PROCESS 9
Mems design process- Methods, Selection of materials for process, Optimization techniques in design, Over view of additive process for –Semiconductors , Dielectric materials, Metals, and Polymer Materials, Piezo electric materials, Shape memory alloys , Micromachining techniques, packaging methods.

UNIT IV MATERIALS SYSTEMS 9

UNIT V THERMAL MANAGEMENT OF MATERIALS AND SYSTEMS 9
Temperature effects on circuit operation and physical construction. Laws of heat transfer mechanism and their considerations in the manufacturing process. Thermal management in packaging of electronic materials

TOTAL: 45 PERIODS

OUTCOME
• The students will be able to identify and select electronics materials in designing MEMS under different techniques by taking care of temperature effects.

TEXT BOOKS:
REFERENCE:

PR8073 ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT  L T P C 3 0 0 3

OBJECTIVE:
• To introduce the concepts of economics as applied to Engineering and Management of Finance in business.

UNIT I  FINANCIAL ACCOUNTING  12

UNIT II  PROFIT VOLUME ANALYSIS  10

UNIT III  WORKING CAPITAL MANAGEMENT  8
Current assets and liability decisions – Estimation of working capital requirements – Management of accounts receivable – Inventory – Cash – Inventory valuation methods.

UNIT IV  CAPITAL BUDGETING  7
Significance of capital budgeting – payback period – present value method – Accounting rate of return method.

UNIT V  ENGINEERING ECONOMICS  8

TOTAL : 45 PERIODS

OUTCOME
• The student will be in a position to plan for finance and budget and will be able to manage finance.

TEXT BOOK:

REFERENCES:

PR8074  GREEN ELECTRONICS MANUFACTURING  L T P C  3 0 0 3

OBJECTIVE:
• This course aims to provide students with knowledge on the theories, eco-design concepts, methods, and relevant hands-on experience for designing a range of sustainable green electronic products. It is expected that students will develop their ability to address relevant issues on environmental impact; product design, operating life, and the 3R concept (reduce, reuse, and recycle).

UNIT I  INTRODUCTION TO GREEN ELECTRONICS  9
Environmental concerns of the modern society- Overview of electronics industry and their relevant regulations in China, European Union and other key countries- global and regional strategy and policy on green electronics industry. Restriction of Hazardous substances (RoHS) - Waste Electrical and electronic equipment (WEEE - Energy using Product (EuP) and Registration - Evaluation, Authorization and Restriction of Chemical substances (REACH).

UNIT II  GREEN ELECTRONICS MATERIALS &PRODUCTS  9
Introduction to green electronic materials and products - Lead (Pb) -free solder pastes, conductive adhesives, halogen-free substrates and components. Substitution of non-recyclable thermosetting polymer based composites with recyclable materials X-Ray Fluorescence (XRF) for identifying hazardous substances in electronic products

UNIT III  GREEN ELECTRONICS ASSEMBLY AND RECYCLING  9
Various processes in assembling electronics components - the life-cycle environmental impacts of the materials used in the processes - substrate interconnects . Components and process equipments used. Technology and management on e-waste recycle system construction, global collaboration, and product disassembles technology.

UNIT IV  PRODUCT DESIGN AND SUSTAINABLE ECO-DESIGN  9
Stages of product development process in green design: Materials- Manufacturing - Packaging and use - End of Life and disposal - Design for recycling - Life Cycle Assessment (LCA), and Eco-design tools - Environmental management systems, and International standards - Eco-design in electronics industry

UNIT V  CASE STUDIES  9

TOTAL: 45 PERIODS

OUTCOME
The students will be able to design reliable range of sustainable green electronic products without wastages by taking into account various environmental conditions.

**TEXT BOOKS:**

**REFERENCES:**
2. Green Communications and Networks, by Yuhang yang and Maode Ma, Springer Publication.

**PR8076 SENSORS AND CONTROL SYSTEMS IN MANUFACTURING**

**OBJECTIVE:**
- To introduce concepts of sensors and control systems and their applications in Manufacturing.

**UNIT I INTRODUCTION**

**UNIT II SENSOR IN PRECISION MANUFACTURING**

**UNIT III SENSORS AND CONTROL IN CIM AND FMS**

**UNIT IV NETWORKING OF SENSORS AND CONTROL SYSTEM IN MANUFACTURING**

**UNIT V RECENT TRENDS IN SENSOR AND CONTROL SYSTEM**
Fiber Optics in Sensor and Control System.- Fibre Optics Parameters, Configurations, Photo Electric Sensor for Long Distance, Sensor Alignment Techniques, Sensors for Biomedical Technology.

**TOTAL: 45 PERIODS**
OUTCOME

- The students will be able to design and control various manufacturing process using suitable sensors and control techniques.

TEXT BOOK:


REFERENCE:


PR8077 SURFACE ENGINEERING

OBJECTIVE:

- To expose the student on the various treatment and procedures available.

UNIT I METAL CLEANING AND PREVIEW ON SURFACE ENGINEERING 8


UNIT II THERMAL SPRAYING PROCESSES AND ELECTRODEPOSITED COATINGS 10


UNIT III HOT DIP COATING AND DIFFUSION COATINGS 10


UNIT IV NON-METALLIC COATING OXIDE AND COVERSION COATINGS 9


UNIT V QUALITY ASSURANCE, TESTING AND SELECTION OF COATINGS 8

The quality plan – design – testing and Inspection of thickness adhesion, corrosion, resistance

TOTAL : 45 PERIODS

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

TEXT BOOK:

REFERENCES:

GE8072 DISASTER MANAGEMENT

L T P C
3 0 0 3

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

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

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

TOTAL: 45 PERIODS

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

TEXTBOOK:

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

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

UNIT I


UNIT II


UNIT III

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

UNIT IV

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V


TOTAL : 45 PERIODS

OUTCOME:

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES: