ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
B.E. MECHANICAL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
I. To prepare students to excel in Mechanical Engineering profession.
II. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve industrial and societal problems.
III. To train students with good scientific and engineering knowledge so as to comprehend, analyze, design and develop innovative products and provide solutions for the real life problems.
IV. To inculcate students with professional and ethical attitude, effective communication skills, teamwork skills and multidisciplinary approach.
V. To develop students with academic excellence and leadership qualities for a successful professional career.

PROGRAMME OUTCOMES (POs):
On successful completion of the programme,
1. Graduates will demonstrate knowledge of mathematics, science and engineering.
2. Graduates will demonstrate ability to identify, formulate and solve engineering problems.
3. Graduates will demonstrate ability to experiment, analyze and interpret data.
4. Graduates will demonstrate ability to design a system, component, product and process as per needs and specifications.
5. Graduates will demonstrate skills to use modern engineering tools, software and equipments to analyze multidisciplinary problems.
6. Graduates will demonstrate knowledge of professional and ethical responsibilities.
7. Graduates will communicate effectively their technical knowledge.
8. Graduates will understand the impact of engineering solutions on societal transformation.
9. Graduates will develop ability for life-long learning.

Mapping PEO with POs:

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**DIRECTOR**

Centre For Academic Courses
Anna University, Chennai-600 025.
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ANNA UNIVERSITY, CHENNAI
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B.E. MECHANICAL ENGINEERING
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
CURRICULA AND SYLLABI I - VIII SEMESTERS

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*Attended*

*Director*

Centre for Academic Courses
Anna University, Chennai-600 025
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## EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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**SUMMARY**
COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I  GREETING AND INTRODUCING ONESELF  12
Listening – Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading – Skimming a passage – Scanning for specific information; Writing – Guided writing – Free writing on any given topic ( My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS  12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing – Process description( non-technical) - Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - Vocabulary – Compound words – Word formation – Word expansion ( root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL  12
Listening - Listening to lectures/ talks and completing a task; Speaking –Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing – Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative); Grammar – Tenses (perfect), Conditional clauses – Modal verbs; Vocabulary – Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING  12
Listening- Watching videos/ documentaries and responding to questions based on them; Speaking – Informal and formal conversation; Reading – Critical reading (prediction & inference); Writing – Essay writing ( compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS  12
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading – Extensive reading; Writing – Poster making – Letter writing (Formal and E-mail) ; Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary – Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL:60 PERIODS
OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXT BOOK:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book & Workbook) Cambridge University Press, New Delhi: 2005

MA7151 MATHEMATICS – I
(Common to all branches of B.E / B.Tech. Programmes in I Semester)

OBJECTIVES:
- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

UNIT III INTEGRAL CALCULUS
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.
UNIT IV  MULTIPLE INTEGRALS  12

UNIT V  DIFFERENTIAL EQUATIONS  12
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.

TOTAL: 60 PERIODS

OUTCOMES:
- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I  PROPERTIES OF MATTER

UNIT II  ACOUSTICS AND ULTRASONICS

UNIT III  THERMAL AND MODERN PHYSICS

UNIT IV  APPLIED OPTICS

UNIT V  CRYSTAL PHYSICS
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditctions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS
OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:

OBJECTIVE
To develop an understanding about fundamentals of polymer chemistry.
Brief elucidation on surface chemistry and catalysis.
To develop sound knowledge photochemistry and spectroscopy.
To impart basic knowledge on chemical thermodynamics.
To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY
UNIT IV  CHEMICAL THERMODYNAMICS  9

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; 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 V  NANOCHEMISTRY  9


OUTCOMES
- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXT BOOKS

REFERENCES

GE7152  ENGINEERING GRAPHICS  L T P C 3 2 0 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 HANDSKETCHING  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. 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 both the principal planes by rotating object method and auxiliary plane method.

UNIT IV       PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14
Sectioning of 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.

OUTCOMES:
On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

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.

BS7161

BASIC SCIENCES LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of 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. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

OUTCOME:
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)
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.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXT BOOKS

GE7162 ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes) L T P C 0 0 4 2

OBJECTIVES
- To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL) 15

1. CIVIL ENGINEERING PRACTICES

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.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
- Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

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

2. ELECTRICAL ENGINEERING PRACTICES 15
- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp
GROUP – B (MECHANICAL AND ELECTRONICS)  15

3. MECHANICAL ENGINEERING PRACTICES

WELDING
• Arc welding of Butt Joints, Lap Joints, and Tee Joints
• Gas welding Practice.
• Basic Machining - Simple turning, drilling and tapping operations.
• Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
  c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES
• Soldering simple electronic circuits and checking continuity.
• Assembling electronic components on a small PCB and Testing.
• Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES
• Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
• Ability to use welding equipments to join the structures
• Ability to do wiring for electrical connections and to fabricate electronics circuits.

HS7251 TECHNICAL ENGLISH L T P C
4 0 0 4

OBJECTIVES
• To enable students acquire proficiency in technical communication.
• To enhance their reading and writing skills in a technical context.
• To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING  12
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills(opening, turn taking, closing )-explaining how something works-describing technical functions and applications; Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement–structuring paragraphs.

UNIT II SUMMARISING  12
Listening- Listening to lectures/ talks on Science & Technology; Speaking –Summarizing/ Oral Reporting, Reading – Reading Scientific and Technical articles; Writing- Extended definition –Lab Reports – Summary writing.

UNIT III DESCRIBING VISUAL MATERIAL  12
Listening- Listening to a panel discussion; Speaking – Speaking at formal situations; Reading – Reading journal articles - Speed reading; Writing-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION  12
Listening- Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice (mock interview); Reading – Reading job advertisements and profile of the company concerned; Writing- job application – cover letter –Résumé preparation.
UNIT V  REPORT WRITING
Listening- Viewing a model group discussion; Speaking – Participating in a discussion - Presentation; Reading – Case study - analyse - evaluate – arrive at a solution; Writing – Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:
Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

OUTCOMES
• Students will learn the structure and organization of various forms of technical communication.
• Students will be able to listen and respond to technical content.
• Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

REFERENCES:

MA7251 MATHEMATICS - II
(Common to all branches of B.E./B.Tech. Programmes in II Semester)

OBJECTIVES:
• To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
• To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
• To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the 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  MATRICES  12

UNIT II  VECTOR CALCULUS  12
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III  ANALYTIC FUNCTION  12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions \( w = z+c, \frac{1}{z}, \frac{1}{z^2} \) - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  12

UNIT V  LAPLACE TRANSFORMS  12

TOTAL: 60 PERIODS

OUTCOMES: Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I  INTRODUCTION

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II  C PROGRAMMING BASICS


UNIT III  ARRAYS AND STRINGS


UNIT IV  POINTERS

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V  FUNCTIONS AND USER DEFINED DATA TYPES


TOTAL :45 PERIODS

OUTCOMES

At the end of the course, the student should be able to:

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXT BOOKS:


REFERENCES:

OBJECTIVE:

- The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I  STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12

UNIT III  DISTRIBUTED FORCES  16
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration, Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION  8
The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V  DYNAMICS OF PARTICLES  12

OUTCOME:

- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES
ME7252 MANUFACTURING TECHNOLOGY – I

OBJECTIVE:
- To introduce the students to the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I METAL CASTING PROCESSES

UNIT II METAL JOINING PROCESSES

UNIT III BULK DEFORMATION PROCESSES

UNIT IV SHEET METAL PROCESSES

UNIT V MANUFACTURE OF PLASTIC COMPONENTS

TOTAL: 45 PERIODS
OUTCOMES:
- Upon completion of this course, the students can apply the different manufacturing process and use this in industry for component production.

TEXT BOOKS:

REFERENCES:

ME7261 MANUFACTURING TECHNOLOGY LAB I

OBJECTIVE
- To give the students hands on experience in the basic manufacturing processes like metal casting, metal joining, metal forming and manufacture of plastic components.

LIST OF EXPERIMENTS
1. Fabrication of simple structural shapes using Gas Metal Arc Welding
2. Joining of plates and pipes using Submerged arc welding
3. Friction stir welding of aluminium plates
4. Preparation of green sand moulds
5. Casting of aluminium components
6. Die casting of aluminium components
7. Stir casting of aluminium components
8. Open and closed die forging of light metal components
9. Reducing the thickness of the plates using two-high rolling process
10. Reducing the diameter of using Wire drawing
11. Extrusion of metal components of simple shapes
12. Manufacturing of simple sheet metal components using shearing and bending operations.
13. Drawing of cup shaped products
14. Manufacturing of sheet metal components using metal spinning on a lathe
15. Forming of simple sheet metal parts by Water hammer forming process
16. Extrusion of plastic components

TOTAL: 60 PERIODS

OUTCOME
- Upon completion of this course the students can demonstrate the capability to fabricate metal / plastic components using basic manufacturing processes.
OBJECTIVES

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real-world problems.
- To learn to use user-defined data structures.

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
10. Program using structures and unions.

OUTCOMES

At the end of the course, the student should be able to:

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

30 Systems with C compiler

TOTAL: 60 PERIODS

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 hollow 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 – Lamé’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:

CE 7352  FLUID MECHANICS AND MACHINERY  L  T  P  C
3  0  0  3

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

UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, 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
UNIT III  DIMENSIONAL ANALYSIS  9
Need for dimensional analysis – methods of dimensional analysis – Similitude – types of similitude - Dimensionless parameters - application of dimensionless parameters – Model analysis.

UNIT IV  PUMPS  9

UNIT V  TURBINES  9

OUTCOMES:
Upon completion of this course, the students will be able to:
- Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Critically analyse the performance of pumps and turbines.

TEXT BOOKS:

REFERENCES:

EC 7354  ELECTRONICS ENGINEERING  L  T  P  C
3  0  0  3

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

UNIT I  SEMICONDUCTORS AND RECTIFIERS  9
P-N junction, VI Characteristics of PN junction diode, Zener diode, Zener diode Characteristics, Zener diode as a regulator, BJT and N-MOSFET working and V-I characteristics.

UNIT II  AMPLIFIERS AND OSCILLATORS  9

UNIT III  LINEAR INTEGRATED CIRCUITS  9
Operational amplifier –Inverting and Non-inverting amplifiers, Adder, integrator and differentiator, Instrumentation amplifier, Digital to Analog converters - R-2R and weighted resistor types, Analog
to Digital converters - Successive approximation and Flash types, IC 555 based Astable and Monostable Multivibrators,

UNIT IV  DIGITAL ELECTRONICS  9

UNIT V  TRANSDUCERS AND DISPLAY DEVICES  9
Thermistors, Semiconductor strain gauges, LVDT, Tachometer, Ultrasonic and Thermal flow meter, pressure force and weight measurement, Seven segment display, LED and LCD

TOTAL : 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Identify and apply electronics components to design circuits.

TEXT BOOK:

REFERENCES:
5. Transducers in Mechanical and Electronic Design by Trietley
UNIT V  MECHANICAL MEASUREMENTS

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.

TOTAL : 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Explain different types of electrical machines and their performance.

TEXT BOOKS:

REFERENCES:

MA 7302  PARTIAL DIFFERENTIAL EQUATIONS  L  T  P  C  4  0  0  4

OBJECTIVES :

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To demonstrate the utility of numerical techniques of partial differential equations in solving engineering problems where analytical solutions are not readily available. The focus will be on finite difference methods.
- To solve PDEs in one or more "space" dimensions using finite difference methods and to discuss the stability limits for these numerical schemes.

UNIT I  PARTIAL DIFFERENTIAL EQUATIONS  12

UNIT II  FOURIER SERIES  12
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.
UNIT III  
FOURIER SERIES SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS  
Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV  
FINITE DIFFERENCE SOLUTION TO HEAT EQUATION  

UNIT V  
FINITE DIFFERENCE SOLUTION TO POTENTIAL AND WAVE EQUATIONS  
Iterative solution of linear system of equations: Gauss-Jacobi, Gauss-Seidel and SOR methods -- Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – Leibmann’s method – Lax-Wendroff scheme for first order hyperbolic equation - Explicit finite difference scheme for one space dimensional wave equation.

OUTCOMES:
- Students acquire basic understanding of the most common partial differential equations, and to learn some methods for solving them. The main goal of the course is that the student, after finished studies, should be able to solve boundary value problems for Laplace’s equation, the heat equation, the wave equation.

TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:

ME 7301  
ENGINEERING THERMODYNAMICS  
L T P C  
4 0 0 4

OBJECTIVE:
- To train the students on the basics and applications of energy in Mechanical Engineering

UNIT I  
BASIC CONCEPTS AND FIRST LAW  
UNIT II  SECOND LAW  12

UNIT III  PURE SUBSTANCES AND STEAM POWER CYCLE  12
Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart. Ideal and actual Rankine cycles.

UNIT IV  IDEAL AND REAL GASES THERMODYNAMIC RELATIONS  12

UNIT V  GAS MIXTURES AND PSYCHROMETRY  12

TOTAL : 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
• Thermodynamic principles to Engineering Applications.
• Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

TEXT BOOKS:

REFERENCES:

CE 7312  FLUID MECHANICS AND STRENGTH OF MATERIALS  L T P C
LABORATORY  0 0 4 2

OBJECTIVES:
• To study the mechanical properties of materials when subjected to different types of loading.
• To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.

36
UNIT – I  STRENGTH OF MATERIALS  
LIST OF EXPERIMENTS  
1. Tension test on mild steel rod  
2. Torsion test on mild steel rod  
3. Hardness test on metal beam (Rockwell and Brinell Hardness Tests)  
4. Compression test on helical spring  
5. Deflection test on carriage spring  

UNIT – II  FLUID MECHANICS AND MACHINES LABORATORY  
LIST OF EXPERIMENTS  
A. FLOW MEASUREMENT  
1. Flow through Venturimeter  
B. PUMPS  
2. Characteristics of Centrifugal pumps  
3. Characteristics of Gear pump  
4. Characteristics of Submersible pump  
5. Characteristics of Reciprocating pump  
C. TURBINES  
6. Characteristics of Francis turbine  
D. DETERMINATION OF METACENTRIC HEIGHT  
7. Determination of Metacentric height

OUTCOMES:
Upon completion of this course, the students will be able to:  
- Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.  
- Use the measurement equipments for flow measurement.  
- Perform test on different fluid machinery.

REFERENCES:

EE7261  ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY  
OBJECTIVE:  
- To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:  
1. Load test on separately excited DC shunt generator  
2. Load test on DC shunt moor  
3. Load test on S Transformer  
4. Load test on Induction motor  
5. Regulation of 3 Alternator  
6. Study of CRO  
7. Logic gates  
8. Operational amplifiers  
9. Time constant of RC circuit  
10. Characteristics of LVDT  
11. Calibration of Rotometer  
12. RTD and Thermistor
13. Flapper Nozzle system

OUTCOMES:
- Ability to perform speed characteristic of different electrical machine
- Ability to use of diodes, transistors for rectifiers
- Ability to use of operational amplifiers

GE 7251  ENVIRONMENTAL SCIENCE AND ENGINEERING  L  T  P  C
3  0  0  3

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

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION  8
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  10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and 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

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 environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving linear system, Eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- 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  12

UNIT II  INTERPOLATION AND APPROXIMATION  12
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  12

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  12

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  12
Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL:60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.

TEXT BOOKS:
REFERENCES:

ME 7352 MANUFACTURING TECHNOLOGY – II

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

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

UNIT II TURNING MACHINES

UNIT III RECIPROCATING, MILLING AND GEAR CUTTING MACHINES
Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutter– machining time calculations - Gear cutting, gear hobbing and gear shaping – gear finishing methods.

UNIT IV ABRASIVE PROCESSES AND BROACHING

UNIT V COMPUTER NUMERICAL CONTROL MACHINE TOOLS
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre and part programming fundamentals – manual part programming and computer assisted part programming.

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Understand and compare the functions and applications of different metal cutting operations, machine tools and gain knowledge in programming of CNC machines.
TEXT BOOKS:

REFERENCES:

ME7401 KINEMATICS OF MACHINES

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

UNIT I  BASICS OF MECHANISMS

UNIT II  KINEMATICS OF LINKAGE MECHANISMS
Displacement, velocity and acceleration analysis of mechanisms – Velocities and accelerations by relative velocity method -Velocity analysis using instantaneous centre method- Velocities and accelerations by Analytical method -Coriolis Acceleration.

UNIT III  KINEMATICS OF CAM MECHANISMS

UNIT IV  GEAR S AND GEAR TRAINS
UNIT V  FRICITION IN MACHINE ELEMENTS  9
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.

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Apply the fundamentals of mechanisms and analyze new mechanisms.
- Understand how the concepts can be applied to various automotive components.

TEXT BOOKS:

REFERENCES:
   Delhi, 1992.
6. John Hannah and Stephens R.C., “Mechanics of Machines”, Viva Low-Prices Student

ME 7402  THERMAL ENGINEERING - I

OBJECTIVES:
- To apply the concepts and laws of thermodynamics for cycle analysis and performance of
  heat engines - Internal Combustion (IC) engines and Gas Turbines.
- To get an insight on the working and performance of air compressors
- To understand the working of various auxiliary systems present in IC engines.

UNIT I  GAS AND STEAM POWER CYCLES  9
Air Standard Cycles - Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison
– Rankine, reheat and regenerative cycle.

UNIT II  RECIPROCATING AIR COMPRESSOR  9
Classification and comparison, working principle, work of compression - with and without
clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency. Multistage air
compressor with Intercooling. Working principle and comparison of Rotary compressors with
reciprocating air compressors.

UNIT III  INTERNAL COMBUSTION ENGINES AND COMBUSTION  9
IC engine – Classification, working, components and their functions. Ideal and actual : Valve and
port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison.
Geometric, operating, and performance comparison of SI and CI engines. Desirable properties

**UNIT IV INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS**

9


**UNIT V GAS TURBINES**

9


**OUTCOMES:**

Upon completion of this course, the students will be able to:

- Analyse the theory and performance of air-standard cycles
- Understand functioning and performance of IC engines and its sub systems
- Understand the working of Gas turbines and their performance

**TEXT BOOKS:**


**REFERENCES:**

Plasma hardening – Thermo-mechanical treatments - elementary ideas on sintering.

UNIT III FERROUS AND NON-FERROUS METALS

UNIT IV NON-METALLIC MATERIALS

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the phase diagrams and relate to the heat treatment processes.
- Tailor structure-property correlations to engineering materials.
- Select proper engineering materials for various engineering applications.
- Perform various testing’s to find the properties of engineering materials.

TEXT BOOKS:

REFERENCES:

ME 7361 MANUFACTURING TECHNOLOGY LABORATORY - II

OBJECTIVE:
- To study and acquire knowledge on various basic machining operations and special purpose machines and their applications.

LIST OF EXPERIMENTS
1. Taper Turning and Eccentric Turning using lathe
2. External and Internal Thread cutting using lathe
3. Knurling
4. Shaping – Square and Hexagonal Heads
5. Drilling and Reaming
6. Contour milling - vertical milling machine
7. Spur and helical gear cutting using milling machine
8. Gear generation using gear hobber
9. Gear generation using gear shaper
10. Grinding – Cylindrical, Surface and Centerless grinding
11. Tool angle grinding with tool and Cutter Grinder
12. Spline Broaching
13. Measurement of cutting forces in Milling /Turning Process
14. CNC Part Programming

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Utilise various machine tools
- Develop CNC part programs.

ME 7411  THERMAL ENGINEERING LABORATORY – I

OBJECTIVES:
- To study the performance characteristics of various engines
- To understand the need for proper in engines
- To understand boiler operation and conduct a performance test on a boiler and steam turbine

UNIT – I  IC ENGINE LAB
LIST OF EXPERIMENTS: 30
2. Actual p-v diagrams of IC engines.
3. Performance test of Reciprocating Air compressor
4. Performance Test on four – stroke Diesel Engine.
6. Morse Test on Multi-cylinder Petrol Engine.
7. Retardation Test on a Diesel Engine.
8. Determination of p-θ diagram and heat release characteristics of an IC engine.
9. Determination of Flash Point and Fire Point of various fuels / lubricants.

UNIT – II  STEAM LAB
LIST OF EXPERIMENTS: 30
1. Study of Steam Generators and Turbines.

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Understand the performance parameters of IC engines and their significance
- Understand the importance of valve timing, and overlap on performance
- Understand the necessity and significance of a boiler trial
- Understand the performance parameters in a reciprocating compressor.

ME 7501  DYNAMICS OF MACHINES

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Utilise various machine tools
- Develop CNC part programs.
OBJECTIVES:
- To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
- To understand the effects of unbalances resulting from prescribed motions in mechanisms.
- To understand the fundamentals of vibrations.
- To understand the principles in mechanisms used for governing of machines.

UNIT I  FORCE ANALYSIS  12

UNIT II  BALANCING  12

UNIT III  FREE VIBRATION  12

UNIT IV  FORCED VIBRATION  12

UNIT V  MECHANISMS FOR CONTROL  12

TOTAL:60 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Analyse the forces acting in a mechanical system and related vibration issues.

TEXT BOOKS:

REFERENCES:

47
# ME 7502
## METROLOGY AND MEASUREMENTS

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### OBJECTIVE:
- To expose the science behind the measurements and their applications in manufacturing industries in quality control.

### UNIT I BASICS OF METROLOGY
9

### UNIT II LINEAR AND ANGULAR MEASUREMENTS
9

### UNIT III METROLOGY OF SURFACES
9

### UNIT IV METROLOGY OF ASSEMBLY AND TRANSMISSION ELEMENTS
9

### UNIT V ADVANCES IN METROLOGY
9

### OUTCOME:
Upon completion of this course, the students will be able to:
- Make logical, rational and economical choice of measuring equipment / method to analyse and improve manufacturing processes.

### TEXT BOOKS:

### REFERENCES:
OBJECTIVES:

- To apply the thermodynamic concepts for systems like Nozzles, Boilers, Turbines, and Refrigeration & Air Conditioning Systems.
- To understand the concept of utilising residual heat in thermal systems.

UNIT I STEAM NOZZLE
Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

UNIT II BOILERS

UNIT III STEAM TURBINES
Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing.

UNIT IV COGENERATION AND RESIDUAL HEAT RECOVERY

UNIT V REFRIGERATION AND AIR – CONDITIONING

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the working of Nozzles, Boilers & Steam Turbines and their performance
- Understand cogeneration, its types, source of residual heat and their utilising techniques
- Understand the working of Refrigeration & Air- conditioning systems and perform cooling load calculations to determine heating loads

REFERENCES:
OBJECTIVES:
- To understand 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 the use of standard practices in design.

UNIT I  FUNDAMENTAL CONCEPTS IN DESIGN

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

UNIT III  TEMPORARY AND PERMANENT JOINTS

UNIT IV  ENERGY STORING ELEMENTS AND ENGINE COMPONENTS
Types of springs, design of helical and concentric springs–surge in springs, Design of laminated springs - Flywheels considering stresses in rims and arms for engines and presses - Solid and Rimmed flywheels - Connecting Rods and crank shafts.

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

OUTCOMES:
Upon completion of this course, the students will be able to:
- Appreciate the functions of various machine elements and assemblies
- Design various machine components according to the requirement as per the prescribed standards
- Use standard design data books.

TEXT BOOKS:

REFERENCES:
ME 7553 HYDRAULICS AND PNEUMATICS

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OBJECTIVES:
- To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.
- To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.
- To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS

UNIT II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS

UNIT III HYDRAULIC CIRCUITS AND 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 AND ELECTRO PNEUMATIC SYSTEMS

UNIT V TROUBLE SHOOTING AND APPLICATIONS
Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Design of hydraulic circuits for Drilling, Planning, Shaping, Surface grinding, Press and
Forklift applications. Design of Pneumatic circuits for Pick and Place applications and tool handling in CNC Machine tools – Low cost Automation – Hydraulic and Pneumatic power packs.

OUTCOMES:
Upon completion of this course, the students will be able to:
- Identify hydraulic and pneumatic components and its symbol and usage.
- Ability to design hydraulic and pneumatic circuits.

TEXT BOOKS:

REFERENCES:

ME 7511 METROLOGY AND DYNAMICS LABORATORY

OBJECTIVES:
- To give an understanding of some of the basic measurements carried out in manufacturing industries and the importance of calibrating measuring instruments.
- To understand the principles of kinematics and Dynamics involved in various mechanisms.

UNIT I METROLOGY AND MEASUREMENTS

LIST OF EXPERIMENTS
2. Calibration and use of measuring instruments – depth micrometer, bore gauge, telescopic gauge
3. Measurement of linear dimensions using Comparators
4. Measurement of angles using bevel protractor and sine bar
5. Measurement of screw thread parameters – Screw thread Micrometers, Three wire method, Toolmaker’s microscope
6. Measurement of gear parameters – Micrometers, Vernier caliper, Gear tester
7. Measurement of features in a prismatic component using Coordinate Measuring Machine (CMM)
8. Programming of CNC Coordinate Measuring Machines for repeated measurements of identical components
9. Non-contact (Optical) measurement using Measuring microscope / Profile projector and Video measurement system
10. Measurement of form parameters – Straightness, Flatness, Roundness, Cylindricity, Perpendicularity, Runout, Concentricity – in the given component using Roundness tester
11. Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus based instruments
UNIT II  DYNAMICS MEASUREMENTS

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 Crank Rocker, Double crank, Double rocker, Slider Crank and 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 and effort for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
   b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and double rotor systems - Undamped and Damped Natural frequencies.
   b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses.
    b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
    c) Determination of transmissibility ratio using vibrating table.

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Use and calibrate various measuring instruments
- Understand the measurement of various kinematic and vibration parameters.

ME 7561  COMPUTER AIDED MACHINE DRAWING

OBJECTIVES:

- To make the students understand and interpret drawings of machine components
- To prepare assembly drawings both manually and using standard CAD packages
- To familiarize the students with Indian Standards on drawing practices and standard components
- To gain practical experience in handling 2D drafting and 3D modeling software systems.

UNIT I  DRAWING STANDARDS & FITS AND TOLERANCES


UNIT II  INTRODUCTION TO 2D DRAFTING

- Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing.
• Bearings - Bush bearing, Plummer block
• Valves – Safety and non-return valves.

UNIT III 3D GEOMETRIC MODELING AND ASSEMBLY
• Couplings – Flange, Universal, Oldham’s, Muff, Gear couplings
• Joints – Knuckle, Gib & cotter, strap, sleeve & cotter joints
• Engine parts – Piston, connecting rod, cross-head (vertical and horizontal), stuffing box, multi-plate clutch
• Miscellaneous machine components – Screw jack, machine vice, tail stock, chuck, vane and gear pumps

TOTAL:60 PERIODS

Total:20% of classes for theory classes and 80% of classes for practice
Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D / 3D CAD software.

OUTCOMES:
Upon completion of this course, the students will be able to:
• Appreciate the functions of various machine assemblies,
• Draw part drawings, sectional views and assembly drawings as per standards

TEXT BOOK:

REFERENCES:

ME 7354 MECHATRONICS

OBJECTIVE:
• To impart knowledge about the elements and techniques involved in Mechatronics systems in understanding the concept of automation.

UNIT I INTRODUCTION

UNIT II 8085 MICROPROCESSOR
UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV  PROGRAMMABLE LOGIC CONTROLLER
Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC.

UNIT V  ACTUATORS AND MECHATRONICS SYSTEM DESIGN

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Design Mechatronics systems with the help of Microprocessor, PLC and other Electrical and Electronics Circuits.

TEXT BOOKS:

REFERENCES:

ME 7551  COMPUTER AIDED DESIGN

OBJECTIVES:
- To understand fundamental concepts of computer graphics and its tools in a generic framework.
- To provide clear understanding of CAD systems for 3D modeling and viewing.

UNIT I  FUNDAMENTALS OF COMPUTER GRAPHICS
Product cycle- Design process - Computer Aided Design – Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - graphic primitives (point, line, circle drawing algorithms) - Clipping- viewing transformation.

UNIT II  GEOMETRIC MODELING
Representation of curves - Hermite cubic spline curve, Bezier curve, B-spline curves, Surface Modeling – Surface Entities, Representation of Surface, Bezier Surface, B-Spline Surface
and Coons Surface, Solid Modeling - Solid Entities, Solid Representation, Boundary Representation (B-Rep), Sweeps Representation, Constructive Solid Geometry (CSG).

UNIT III VISUAL REALISM 9

UNIT IV PART ASSEMBLY 9
Mass properties - Assembly modeling – Inference of position and orientation – Geometric Dimensioning and Tolerancing – Functional importance of various types of fits, Geometrical dimensioning and Tolerancing, Tolerance stacking – types and remedies.

UNIT V CAD STANDARDS 9
Standards for computer graphics- Graphical Kernel System (GKS) - Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, ACIS and DXF - communication standards.

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the various stages in the design process and the role of computer graphic communication process.
- Understand the mathematics behind the use of computer for modeling of mechanical components.

TEXT BOOK:

REFERENCES:
teeth - forces.

UNIT III BEVEL AND WORM GEARS 12
Straight bevel gear: Gear materials - Tooth terminology, tooth forces and stresses, equivalent number of teeth, estimation of dimensions of straight bevel gears.
Worm Gear: Gear materials - Tooth terminology, Thermal capacity, forces and stresses, efficiency, estimation of dimensions of worm gear pair.

UNIT IV GEAR BOXES 12

UNIT V CLUTCHES, BRAKES AND CAMS 12
Design of single and multi plate clutches, cone clutches, internal expanding rim clutches and Electromagnetic clutches. Design of brakes: External shoe brakes - Single and Double Shoe, Internal expanding shoe brakes and Band brakes.
Design of Cams: Types- Pressure angle and under cutting, determination of base circle -forces and surface stresses.

TOTAL:60 PERIODS

Note: (Use of standard Design Data Book is permitted in the University examination)

OUTCOMES:
Upon completion of this course, the students will be able to:
- Appreciate the functions of various transmission elements and their assemblies
- Design different transmission components according to the requirement as per standards using data books.

TEXT BOOKS:

REFERENCES:

ME 7602 HEAT AND MASS TRANSFER L T P C 4 0 0 4

OBJECTIVES:
- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

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UNIT I CONDUCTION 12

UNIT II CONVECTION 12

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 12

UNIT IV RADIATION 12

UNIT V MASS TRANSFER 12

TOTAL: 60 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
• Understand and apply different heat and mass transfer principles of different applications.

TEXT BOOKS:

REFERENCES:

HS7561 COMMUNICATION SKILLS AND SOFT SKILLS L T P C 1 0 2 2

COURSE DESCRIPTION
This course aims to help engineering students acquire the employability skills necessary for the workplace. It also attempts to meet the expectations of the employers by giving special attention to presentation skills, group discussion skills and soft skills. This aim will be achieved through expert
guidance and teaching activities focusing on the above listed skills and language skills in the Language Laboratory.

OBJECTIVES
- To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills and soft skills.
- To help them improve their writing skills necessary for the workplace situation.

CONTENTS

UNIT I   WRITING SKILLS
Preparing job applications – writing the cover letter and resume – applying for jobs online – e-mail etiquette – writing reports – collecting, analyzing and interpreting data.

UNIT II   SOFT SKILLS

UNIT III PRESENTATION SKILLS
Preparing slides using the computer– structuring the content (parts of a presentation)– body language – answering questions – individual presentation practice — mini presentation (practice sessions)

UNIT IV GROUP DISCUSSION SKILLS
Participating in group discussions – understanding group dynamics – brainstorming – questioning and clarifying – GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD – mock GD.

UNIT V INTERVIEW SKILLS
Interview etiquette–technical Interview/HR Interview/body language – mock interview – attending job interviews – Types of interviews- telephone/skype interview – stress interview, one to one/panel interview – FAQs related to job interview.

TOTAL: 45 PERIODS

OUTCOMES:
- Students will be able to make presentations and participate in group discussions with confidence.
- Students will be able to perform well in interviews.
- They will have adequate writing skills.

REFERENCES:

EXTENSIVE READERS

WEB RESOURCES
ME 7611 THERMAL ENGINEERING LABORATORY – II  

OBJECTIVES
- To study the heat transfer characteristics of various heat transfer apparatus
- To study the performance of refrigeration cycle / components.

LIST OF EXPERIMENTS:
1. Thermal conductivity measurement using guarded plate apparatus.
2. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.
3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
4. Determination of heat transfer coefficient under forced convection from a tube.
5. Determination of Thermal conductivity of composite wall.
6. Determination of Thermal conductivity of insulating powder.
7. Heat transfer from pin-fin apparatus (natural & forced convection modes)
8. Determination of Stefan – Boltzmann constant.
10. Determination of Effectiveness of Parallel / counter flow heat exchanger.
11. Determination of COP of a refrigeration system
12. Performance test in a simple Air-Conditioning system
13. Performance test on a cooling tower

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course the students can
- Determine the heat transfer coefficient and performance of different heat transfer equipments
- Perform a load test on Refrigeration & Air-conditioning test rig to determine their effectiveness.

ME 7355 POWER PLANT ENGINEERING

OBJECTIVES:
- To understand the working of power plants and analyse their performance.
- To learn the economics of power generation.

UNIT I HYDRO POWER PLANTS

UNIT II COAL, OIL AND GAS TURBINE POWER PLANTS

UNIT III NUCLEAR POWER PLANTS
Layout and subsystems. Fuels and Nuclear reactions. Boiling Water Reactor, Pressurized Water Reactor, Fast Breeder Reactor, Gas Cooled and Liquid Metal Cooled Reactors – working and

UNIT IV RENEWABLE ENERGY POWER PLANTS

UNIT V ECONOMICS OF POWER GENERATION

OUTCOMES:
Upon completion of this course the students will be able to:
- Understand the working of different power plants
- Arrive at cost of power generation, electricity billing and rate of return on power plant investments

TEXT BOOKS:

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


UNIT V  INDUSTRIAL ROBOTICS


OUTCOME:
Upon completion of this course, the students will be able to:
- Acquire the required capability to gradually convert Traditional Manufacturing environment to Computer Integrated Manufacturing environment.

TEXT BOOK:

REFERENCES:

ME 7751  FINITE ELEMENT ANALYSIS

OBJECTIVES:
- To introduce the concepts of Mathematical Modeling and numerical solution of engineering problems.
- To appreciate the use of Finite Element Method to a range of engineering problems.

UNIT I  INTRODUCTION


UNIT II  ONE-DIMENSIONAL PROBLEMS


UNIT III  TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation – Finite Element formulation – Triangular elements and Quadrilateral elements- Shape functions and element matrices and vectors. Application to Field Problems - Thermal problems – Torsion of Non
UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS  

UNIT V  ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS  

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the use of the FEM to solve problems in Mechanical Engineering.
- Use the Finite Element Method to solve Structural, thermal and Eigen value problems.

TEXT BOOKS:

REFERENCES:

ME 7711  CREATIVE AND INNOVATIVE PROJECT  
OBJECTIVES:
- The goal of this course is to help students to identify innovative projects that promotes creativity to explore the variables that affect creativity and innovation.
- By the end of the semester, the 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 precondition for competitive advantage.
- Each student will choose a frequently/commonly encountered 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.

TOTAL:60 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to take up any challenging practical problem and find solutions by formulating proper methodology.
OBJECTIVES:
- To give exposure to software tools needed to analyze engineering problems.
- To expose the students to different applications of simulation and analysis tools.

UNIT I SIMULATION
LIST OF EXPERIMENTS
1. MANUAL PART PROGRAMMING:
   (i) Part Programming - CNC Machining Centre
      a) Linear Cutting.
      b) Circular Cutting.
      c) Cutter Radius Compensation.
      d) Canned Cycle Operations.
   (ii) Part Programming - CNC Turning Centre
      a) Straight, Taper and Radius Turning.
      b) Thread Cutting.
      c) Rough and Finish Turning Cycle.
      d) Drilling and Tapping Cycle.
2. COMPUTER AIDED PART PROGRAMMING
   e) CL Data and Post process generation using CAM packages.
   f) Application of CAPP in Machining and Turning Centre.
3. STUDY OF CNC EDM, CNC EDM WIRE-CUT AND RAPID PROTOTYPING.

UNIT II ANALYSES
LIST OF EXPERIMENTS
Use of any finite element analysis software for following problems:
1. Force and Stress analysis using link elements in Trusses, cables and bars.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of fins, plates and cylinders.
6. Vibration analysis of spring-mass systems.
7. Modal analysis of Beams.
8. Harmonic, transient and spectrum analysis of simple systems

OUTCOME:
Upon completion of this course, the students will be able to:
- Understand the use of analysis and simulation software to solve problems in Mechanical Engineering.
OBJECTIVES:
- To develop codes for the microprocessor, microcontroller and PLC.
- To gain knowledge about the various types of sensors and signal conditioning units.
- To interface the I/O devices with microprocessor, microcontroller and PLC.
- To understand the method of actuating and controlling the speed of electrical and mechanical drives.
- To understand image processing techniques and DAQ system.

LIST OF EXPERIMENTS:
1. Experimental study of basic Signal Conditioning Circuits.
3. Experiments on application of LDR, Optocoupler, Ultrasonic and Infrared sensors.
4. Modelling and Analysis of basic Hydraulic, Pneumatic and Electro-Pneumatic Circuits using Simulation Software.
5. Actuation of Hydraulic, Pneumatic and Electro-Pneumatic circuits.
6. Application of PLC with Timers and Counters.
7. Solving basic Arithmetic Problems using 8085 Microprocessor and 8051 Microcontroller.
9. Speed and Direction Control of DC drives by Microcontroller.
10. Speed Control of AC drives by Microcontroller.
11. Stepper Motor Actuation and Control.
13. Actuation of Double-Acting Cylinder by Microcontroller and PLC.
17. Control of Robotic Actuation by Microcontroller.

TOTAL: 60 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Have hands-on experience with sensors, actuators and controllers which are commonly used in Mechatronics systems.

ME 7811 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.

TOTAL: 300 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Take up any challenging practical problems and find solution by formulating proper methodology.

GE 7071 DISASTER MANAGEMENT

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

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

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

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

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

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.
OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXT BOOKS:

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

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

REFERENCES:

IE7451 PRODUCTION AND OPERATIONS MANAGEMENT L T P C
3 0 0 3

AIM:
• To impart knowledge in the areas of production and Operations management applicable to various types of manufacturing and service systems.

OBJECTIVES
• To understand and appreciate the concept of Production and Operations Management in creating and enhancing a firm’s competitive advantages.
• To understand the concept and contribution of various constituents of Production and Operations Management (both manufacturing and service).
• To understand the interdependence of the operations function with the other key functional areas of a firm.
• To apply analytical skills and problem-solving tools to the analysis of the operations problems.

UNIT I INTRODUCTION

UNIT II FORECASTING
Need, Determinants of Demand, Demand Patterns, Measures of forecast error, Qualitative Forecasting Methods-Delphi techniques. Market Research, Nominal Group Technique Quantitative Forecasting methods – Moving Average Methods, Exponential Smoothing Methods, Regression methods, Monitoring and Control of Forecasts, Requirements and Selection of Good forecasting methods.

UNIT III AGGREGATE PLANNING AND MATERIAL REQUIREMENT PLANNING
Role of aggregate Product planning, Managerial inputs to Aggregate planning, Pure and Mixed strategies, Mathematical Models for Aggregate planning – Transportation Method, Linear programming Formulation, Linear Decision Rules, Master Production Schedule (MPS), Procedure for developing MPS, MRP, Lot sizing methods of MRP, MRP Implementation issues.

UNIT IV CAPACITY MANAGEMENT

UNIT V PRODUCTION ACTIVITY CONTROL AND LEAN MANUFACTURING
Objectives and Activities of Production Activity Control - Introduction to Scheduling in different types of Production Systems.
Lean Manufacturing-Principles – Activities - Tools and techniques - Case studies.

TOTAL: 45 PERIODS
To understand the various parts of the operations and production management processes and their interaction with other business functions
To develop the ability to identify operational methodologies to assess and improve an organization's performance
To develop essential skills of modelling, managing and optimizing operations decisions in manufacturing and service organizations.
Utilize a variety of quantitative and qualitative methods and tools used in managing and improving operations decisions.

REFERENCES:

MA 7352
APPLIED STATISTICS
L T P C
4 0 0 4

OBJECTIVE:
The students will have a fundamental knowledge of the concepts of statistical methods and apply the tools in solving management problems.

UNIT I TESTS OF SIGNIFICANCE
Sampling distributions – Central limit theorem – Tests for single mean, proportion and difference of means, proportions (large and small samples) - Tests for single variance and equality of variances - $\chi^2$ - test for goodness of fit - Independence of attributes.

UNIT II NON-PARAMETRIC TESTS

UNIT III DESIGN OF EXPERIMENTS
Completely randomized design - Randomized block design - Latin square design - $2^2$ factorial design - Taguchi’s robust parameter design.

UNIT IV STATISTICAL QUALITY CONTROL
Control charts for variables - Control charts for attributes - Tolerance limits - Acceptance sampling by attributes.

UNIT V TIME SERIES

TOTAL: 60 PERIODS

OUTCOME:
The students can independently participate in the processes of analysis, planning, formulating strategies of development, decision-making, governing and management, and independent making of tactical and strategic decisions related to the statistics.

TEXT BOOKS:
REFERENCES:

ME 7001 ADVANCED INTERNAL COMBUSTION ENGINEERING  L  T  P  C
3 0 0 3

OBJECTIVES:
- To understand the principles of operation of different IC Engines, combustion process and fuel injection systems.
- To provide knowledge on pollutant formation and control, suitability of alternate fuels, and recent technological advances.

UNIT I SPARK IGNITION ENGINES

UNIT II COMPRESSION IGNITION ENGINES

UNIT III POLLUTANT FORMATION AND CONTROL

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

UNIT V RECENT TRENDS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to
- Understand the combustion process, and the fuel injection techniques adopted in modern day IC engines
- Adopt potential alternative fuel systems and exposed to recent developments in engine technology.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To give an understanding of the advancements in mechanical measurements and their applications in manufacturing industries to optimize manufacturing processes.

UNIT I FUNDAMENTALS OF METROLOGY
Basic metrological concepts, Quality of measurements – errors, Uncertainty, Basic to advanced metrology evolution, Regression analysis, Design of experiments.

UNIT II OPTICAL DIMENSIONAL METROLOGY

UNIT III ADVANCES IN SURFACE METROLOGY - 2D, 3D
Surface Geometry and Its Importance in Function, Surfaces and Manufacture, Filtering – Gaussian, 2RC, Advanced Filters, Surface finish parameters – Amplitude, Spacing, Hybrid, Shape, Autocorrelation, Power Spectral Density, Bearing Area.
3D areal and parametric measurement, Need for 3D surface topography measurement, Stylus instruments, Optical Instruments – Chromatic confocal Microscopy, Interferometry, Non-optical Scanning Microscopy – Scanning electron Microscopes, Scanning probe microscopes, Parameters for characterizing 3D surface topography.

UNIT IV NANOMETROLOGY
Precision to Nanometrology, Optical Micro-Metrology of Small Objects - White-Light Interference 3D Microscopes, Focus-Based Optical Metrology- Fringe projection method, Measurement of Typical Nanofeatures, Measuring Length to Nanoscale with Interferometers and Other Devices, Nano Geometry in Macro Situations.

UNIT V METROLOGY IN MANUFACTURING
Case studies relating to various manufacturing sectors - Automobile, space, nuclear, Tool wear; Metrology in manufacturing research, Role of Metrology in Industry 4.0.

OUTCOME:
Upon completion of this course, the students will be able to:
- Make logical, rational and economical choice of measuring equipment / method to analyse and improve manufacturing processes.

TEXT BOOKS:

REFERENCES:
ME 7003 CASTING AND WELDING PROCESSES  L  T  P  C
3 0 0 3

OBJECTIVE:
- To impart knowledge on Design of Gating system for Castings, Foundry Practice of Ferrous, Non Ferrous alloys, Foundry Mechanisation, Welding Processes and Welding Metallurgy.

UNIT I DESIGN OF GATING SYSTEM

UNIT II FERROUS AND NON FERROUS CASTINGS
Steel Casting – The family of cast iron – melting of steels and cast irons – Grey iron foundry practice – Ductile iron – Malleable Iron casting design – Aluminium, Magnesium, Copper, Zinc, Duplex Stainless Steel and Titanium alloys foundry practice.

UNIT III FOUNDRY MECHANISATION
Mechanical equipments in foundry – plant site location, layout – Plant Engineering – Maintenance – Services – Practical aspects.

UNIT IV WELDING PROCESS AND TECHNOLOGY

UNIT V WELDING METALLURGY

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Design gating system for castings, understand the foundry practices of ferrous and non ferrous metals.
- Understand the various aspects of foundry mechanization, welding metallurgy and certain welding processes.

TEXT BOOK:

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

UNIT I  INTRODUCTION TO COMPOSITE MATERIALS

UNIT II  MANUFACTURING OF COMPOSITES
Manufacturing of Polymer Matrix Composites (PMCs)-handlay-up, spray technique, filament winding, Pultrusion, Resin Transfer Moulding (RTM)-, bag moulding, injection moulding, Sandwich Mould Composites (SMC) - Manufacturing of Metal Matrix Composites (MMCs) - Solid state, liquid state, vapour state processing, Manufacturing of Ceramic Matrix Composites (CMCs) –hot pressing-reaction bonding process-infiltration technique, direct oxidation- interfaces.

UNIT III  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS

UNIT IV  LAMINA STRENGTH ANALYSIS AND ANALYSIS OF LAMINATED FLAT PLATES

UNIT V  THERMAL ANALYSIS

OUTCOME:
- The students will be able to understand the mechanics and design related to layered components such as fiber reinforced polymer composites, isotropic layered structures (example electronic chips) etc and its manufacturing methodologies.

TEXT BOOKS:
REFERENCES:

ME 7006 ENGINEERING MANAGEMENT

OBJECTIVES:
- To provide a clear understanding of basic management principles that leads to corporate building.
- 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

TEXT BOOK:

REFERENCES:

ME 7007 GAS DYNAMICS AND SPACE PROPULSION

OBJECTIVES:
- To understand the fundamentals of compressible flow in constant and variable area ducts.
- To understand the behaviour of shock waves and its effect on flow.
- To gain basic knowledge about Jet and Rocket propulsion.

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS


UNIT II FLOW THROUGH DUCTS

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties. Choking concept, Isothermal flow with friction. Use of Gas tables.

UNIT III NORMAL AND OBLIQUE SHOCKS


UNIT IV JET PROPULSION

Theory of jet propulsion – thrust equation – Performance parameters - thrust, power and efficiency. Operation, cycle analysis and performance of ram jet, turbojet, turbofan, turbo prop and pulse jet engines.
UNIT V  SPACE PROPULSION


TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Apply the principles of gas dynamics in Jet and Space Propulsion.

TEXT BOOKS:

REFERENCES:

ME 7008  MACHINE VISION  L T P C  3 0 0 3

OBJECTIVES:
- To impart knowledge on the Physics behind Digital Image Processing.
- To familiarize with the Methods of Image Acquisition.
- To gain knowledge about Processing and Analyzing the Captured Image.
- To have an idea about Machine Vision Applications.

UNIT I  INTRODUCTION

UNIT II  IMAGE ACQUISITION

UNIT III  IMAGE PROCESSING

UNIT IV IMAGE ANALYSIS

UNIT V MACHINE VISION APPLICATIONS

OUTCOME:
Upon completion of this course, the students will be able to:

TEXT BOOKS:

REFERENCES:

ME 7009 MEASUREMENT AND CONTROLS

OBJECTIVES:
- To students will understand the measurement and control systems which are essential components of manufacturing systems.
- To understand the principle and use of sensors for measurement of different parameters.
- To understand the concept of feedback control systems and their applications.

UNIT I MEASUREMENTS

UNIT II INSTRUMENTS

UNIT III PARAMETERS FOR MEASUREMENT
Dimension, displacement velocity, acceleration, impact – Force, torque, power – strain-pressure –

UNIT IV AUTOMATIC CONTROL SYSTEMS

UNIT V APPLICATION OF CONTROL SYSTEMS
Governing of speed, kinetic and process control – pressure, temperature, fluid level, flow-thrust and flight control – photo electric controls.

OUTCOME:
Upon completion of this course, the students will be able to:

- Appreciate the principles of measurements leading to different measuring instruments and control systems.

TEXT BOOKS:

REFERENCES:

ME 7010 MECHANICAL VIBRATION AND NOISE CONTROL

OBJECTIVES:
- To understand the sources of vibration and noise in various systems.
- To apply the various control techniques to reduce the vibration and noise and improve the life of the components.

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

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

UNIT III AUTOMOTIVE NOISE SOURCES

UNIT IV    TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

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

OUTCOME:
Upon completion of this course, the students will be able to:
- Appreciate the need and its relevance for vibration and noise studies
- Gain knowledge on measurement of vibration and noise levels in machineries and its components.
- Expose themselves to various control measures of both vibration and noise in different industrial applications.

TEXT BOOKS:

REFERENCES:

UNIT II  MICROMANUFACTURING TECHNIQUES  9
Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition-Sputtering, Deposition by Epitaxy, Etching, Bulk Micromanufacturing, Micromachining Processes, LIGA Process, Microsystem Assembly and Testing.

UNIT III  ELECTROSTATIC AND THERMAL BASED MEMS  9

UNIT IV  PIEZO / RESISTIVE / ELECTRIC AND MAGNETIC BASED MEMS  9

UNIT V  MICROFLUIDICS AND APPLICATIONS OF MEMS  9
Microfluidics - Fluid Mechanics Concepts, Design and Fabrication of Channels, Valves, Pumps, Case Studies - Accelerometer, Gyros, RF MEMS and MOEMS.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the working principle of MEMS and methods of manufacturing Microsystems.
- Select suitable Microsystems for Industrial applications.

TEXT BOOKS:

REFERENCES:
UNIT II  PROGRAMMING OF 8051 MICROCONTROLLER  9
Instruction Set - Addressing Modes - I/O Programming - Timer/Counter - Interrupts - Serial Communication of 8051.

UNIT III  PROGRAMMING OF PIC18FXXX MICROCONTROLLER  9
Instruction Set - Addressing Modes - I/O Programming - Timer/Counter - Interrupts – Serial Communication, CCP, ECCP, PWM Programming of PIC18FXXX.

UNIT IV  PERIPHERAL INTERFACING  9
Interfacing of Relays, Memory, Key Board, Displays - Alphanumeric and Graphic, RTC, ADC and DAC, I'C, Stepper Motors and DC Motors, SPI with 8051 and PIC Family.

UNIT V  SPECIAL PURPOSE MICROCONTROLLER & APPLICATIONS  9

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Understand the application of 8051 and PIC microcontrollers.

TEXT BOOKS:

REFERENCES:

ME 7013  NEW AND RENEWABLE SOURCES OF ENERGY  L T P C
3 0 0 3

OBJECTIVES:
- To instruct the importance of renewable energy sources and its utilization.
- To educate the various renewable energy technologies.

UNIT I  SOLAR ENERGY  9

UNIT II  WIND ENERGY  9
Wind data and energy estimation – Betz limit - Site selection for windfarms – Horizontal axis wind

UNIT III   BIO - ENERGY

UNIT IV   OCEAN AND GEOTHERMAL ENERGY

UNIT V   NEW ENERGY SOURCES

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Know the importance of renewable energy sources utilization and various renewable energy technologies.

TEXT BOOKS:

REFERENCES:

ME 7014   NON-DESTRUCTIVE MATERIALS EVALUATION

OBJECTIVE:
- To impart knowledge on various Non-Destructive Evaluation and Testing methods, Interpretation of results, theory and their industrial applications.

UNIT I   INTRODUCTION AND VISUAL INSPECTION METHODS
NDT versus Mechanical testing, Need for NDT, Relative merits and limitations, various physical characteristics of materials and their applications in NDT.
Visual Inspection -Unaided, Aided- Borescopes -Videoscopes, Special features in Borescopes, Selection of borescopes, Optical sensors, Microscopes & replication Microscopy Technique and applications.

UNIT II   LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING
LPT - Principle, types, Procedures, Penetrants and their characteristics, Emulsifiers, Solvent Cleaners / Removers, Developers- properties and their forms, Equipments, Advantages and limitations, Inspection and Interpretation, Applications.
MPT-Principle, Theory of Magnetism, Magnetising current, Magnetisation methods, Magnetic particles, Procedure, Interpretation, Relevant and Non-relevant indications, Residual magnetism,
Demagnetisation – need, methods, Advantages and Limitations, Applications, Magnetic Rubber Inspection, Magnetic Printing, Magnetic Painting.

UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING
Thermography – Introduction, Principle, Contact & Non-Contact inspection methods, Active & Passive methods, Liquid Crystal – Concept, example, advantages & limitations. Electromagnetic spectrum, infrared thermography- approaches, IR detectors, Instrumentation and methods and applications.
Eddy current Testing – Principle, properties of eddy currents, Eddy current sensing elements, probes, Instrumentation, Types of arrangement, Advantages & Limitations, Interpretation of Results & applications.

UNIT IV ULTRASONIC TESTING AND ACOUSTIC EMISSION TESTING
Ultrasonic Testing- Principle, Basic Equipment, Transducers, couplants, Ultrasonic wave, Variables in UT, Transmission and Pulse-echo method, Straight beam and angle beam, A-Scan, B-Scan & C-Scan, Phased Array Ultrasound & Time of Flight Diffraction, Advantages & Limitations, Interpretation of Results & Applications.

UNIT V RADIOGRAPHY

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Evaluate and interpret components / products through NDT either as Quality Assurance Team Member or Production Team Member.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To impart knowledge about the Robot Anatomy and its Kinematics.
- To gain knowledge about Robot Control, Robot Programming and Applications of Robots.

UNIT I  FUNDAMENTALS OF ROBOTICS AND THEIR ACTUATORS  9
Introduction to Robotics, Robot Joints, Robot Configurations - Joint Notations - Work Envelope –
Applications and Limitations, Speed of Motion and Load Carrying Capacity, Robot Control
Systems, Precision of Movement.
Overview of Electric, hydraulic and Pneumatic Drives, Stepper & Servo Drives – Linear & Rotary
types, Smart Actuators of Micro Robots.

UNIT II  ROBOT LOCOMOTION AND END EFFECTORS  9
Walkers - Leg Actuators – Leg Geometry – Walking Techniques, Pipe Crawlers, Tracked Vehicles
and Suspension Systems, Robot End Effector – Grippers and Gripper force analysis – Robot
Tools – Considerations in Gripper Selection and Design.

UNIT III  ROBOT SENSORS AND VISION  9
Tactile Sensors, Proximity and Range Sensors, Sensing and digitizing function in Robot Vision,
Image processing and Analysis, Training the Vision System, Applications of Robot Sensors and
Vision.

UNIT IV  ROBOT MOTION ANALYSIS AND CONTROL  9
Introduction to manipulator Kinematics, Homogeneous Transformations and Robot Kinematics,
Manipulator Path Control, Robot Arm Statics and Dynamics, Trajectory Planning, Robot Control
System.

UNIT V  ROBOT PROGRAMMING AND APPLICATIONS  9
Classification of Robot Languages and Programming, Graphical Simulation of Robotic Work cells,
Robot Cell Design and Control, Humanoid Robots, Micro Robots, Tele-operated Robots,
Application of Robots in Surgery, Manufacturing, Space and Underwater.

OUTCOME:
Upon completion of this course, the students will be able to:
- Have knowledge on the fundamentals of Robotics, Robot Kinematics and Programming
  which help them to build and work with Robots.

TEXT BOOKS:
   2009.
2. 2.Groover M.P., Weiss M., Nagel R.N. and Odrey N.G., “Industrial Robotics -Technology,

REFERENCES:
   2010.
OBJECTIVE:
- To understand the principle of operation and design aspects of Refrigeration & Air conditioning systems and components.

UNIT I VAPOUR COMPRESSION REFRIGERATION SYSTEM

UNIT II REFRIGERANTS AND COMPONENTS OF REFRIGERATION SYSTEMS
Refrigerants desirable properties – Classification - Nomenclature - ODP & GWP; Equipments: Type of Compressors, Condensers, Expansion devices, Evaporators.

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

UNIT IV PSYCHROMETRIC PROPERTIES AND PROCESSES

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

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Appreciate the principles of operation of different Refrigeration and Air conditioning systems in total as well as the significance of the various component system.

TEXT BOOKS:

REFERENCES:
ME 7017 STATISTICAL PROCESS CONTROL AND RELIABILITY ENGINEERING  L T P C  
3 0 0 3

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

UNIT I INTRODUCTION AND STATISTICAL PROCESS CONTROL 9
Introduction:-definitions of quality, Evolution of Quality: Inspection, Quality Control, Quality assurance Customer-Orientation: Internal & External Customer Concept, Life cycle approach to quality costs- Prevention; Appraisal and Failure costs. Seven SPC tools -Histogram, Check sheets, Ishikawa diagrams, Pareto, Scatter diagrams, Control charts and flow chart.

UNIT II ONLINE QUALITY CONTROL 9
Control chart for attributes -control chart for non conformings- p chart and np chart – control chart for nonconformities- C and U charts, Control chart for variables – X chart, R chart and ß chart - State of control and process out of control identification in charts, pattern study and process capability studies.

UNIT III OFFLINE QUALITY CONTROL 9

UNIT IV RELIABILITY CONCEPTS 9
Reliability engineering - fundamentals – failure data analysis, Mean failure rate, Mortality curve-concept of burn –in period, useful life and wear out phase of a system, mean time to failure, mean time between failure, hazard rate – failure density and conditional reliability-Maintainability and availability – simple problems.

UNIT V RELIABILITY ESTIMATION 9

TOTAL: 45 PERIODS

OUTCOME:
- Upon successful completion of this course, the students will be able to apply the concept of SQC in process control for reliable component production

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To impart knowledge on plasticity, surface treatment for forming of various types of metal forming process.
- To study the basic concepts of metal forming techniques and force calculation in metal forming process.
- To study the thermo-mechanical regimes and its requirements in metal forming.

UNIT I THEORY OF PLASTICITY
Theory of plastic deformation—Yield criteria—Tresca and von-Mises—Distortion energy—Stress-strain relation—Mohr’s circle representation of a state of stress—cylindrical and spherical co-ordinate systems—upper and lower bound solution methods—Overview of FEM applications in Metal Forming.

UNIT II THEORY AND PRACTICE OF BULK FORMING PROCESSES
Analysis of plastic deformation in Forging, Rolling, Extrusion, rod/wire drawing and tube drawing—Effect of friction—calculation of forces, work done—Process parameters, equipment used—Defects—applications—Recent advances in Forging, Rolling, Extrusion and Drawing processes—Design consideration in forming.

UNIT III SHEET METAL FORMING
Formability studies—Conventional processes—HERF techniques—Superplastic forming techniques—Hydro forming—Stretch forming—Water hammer forming—Principles and process parameters—Advantage, Limitations and application.

UNIT IV POWDER METALLURGY AND SPECIAL FORMING PROCESSES
Overview of P/M technique—Advantages—applications—Powder preform forging—powder rolling—Tooling, process parameters and applications—Orbital forging—Isothermal forging—Hot and cold isostatic pressing—High speed extrusion—Rubber pad forming—Fine blanking—LASER beam forming.

UNIT V SURFACE TREATMENT AND METAL FORMING APPLICATIONS

OUTCOME:
Upon completion of the course the students will be able to:
- Use of mechanical and thermodynamics principle of plastic deformation to form the components using different metal forming techniques.

TEXT BOOKS:

REFERENCES:

ME 7019 TURBO MACHINERY

OBJECTIVE:
- To understand the process of energy transfer and operating principles of various turbomachines and their use for various engineering applications.

UNIT I WORKING PRINCIPLES

UNIT II CENTRIFUGAL FANS AND BLOWERS

UNIT III CENTRIFUGAL COMPRESSOR

UNIT IV AXIAL FLOW COMPRESSOR

UNIT V AXIAL AND RADIAL FLOW TURBINES

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Explain the various systems, principles and applications and different types of turbo machinery components.

TEXT BOOKS:

REFERENCES:

ME7071 AUTOMOBILE ENGINEERING

OBJECTIVE:
- To provide a first course of teaching such that the learners are able to visualise the scope of Automobile Engineering.

UNIT I INTRODUCTION TO AUTOMOTIVES
An overview of different types of automobiles and their power sources. Specifications, Performance Parameters, Quality standards, Trends in automobile design.

UNIT II POWER SOURCE FEATURES
Reciprocating Engine systems, Rotary Engine systems, Gas Turbine systems, Hybrid systems. Pollutant emissions and their control; Catalytic converter systems, Electronic Engine Management systems.

UNIT III TRANSMISSION, SUSPENSION AND BRAKING SYSTEMS
Clutch system, Gear box system, propeller shafting, differential, axles, wheels and tyres and preliminaries of suspension systems.

UNIT IV AUXILIARY SYSTEMS
Electrical and electronic systems, safety systems, Heating, Ventilation, and Air Conditioning (HVAC) systems, Vehicle Thermal Management System and vehicle body design features.

UNIT V TESTS, SERVICE AND MAINTENANCE
Engine Tuning, vehicle maintenance, engine and Chassis Dynamometry Pollutants and emissions check, Wind Tunnel Tests, preliminaries of engine and vehicle testing.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Identify the different components in an automobile.
- Clearly understand different auxiliary and transmission systems.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence in solving complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I  GOVERNING EQUATIONS AND BOUNDARY CONDITIONS  9

UNIT II  FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION  9

UNIT III  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  9
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV  FLOW FIELD ANALYSIS  9

UNIT V  TURBULENCE MODELS AND MESH GENERATION  9

OUTCOMES:
Upon completion of this course, the students will be able to:
- Create numerical models and their role in the field of fluid flow and heat transfer
- Use the various discretization methods, solution procedures and turbulence models to solve flow and heat transfer problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To understand the design constraints in manufacturing and assembly operations.

UNIT I  INTRODUCTION AND CASTING  9
Introduction - Economics of process selection - General design principles for manufacturability; Design considerations for: Sand cast – Die cast – Permanent mold cast parts.

UNIT II  FORMING  9
Design considerations for: Metal extruded parts – Impact/Cold extruded parts – Stamped parts – Forged parts.

UNIT III  WELDING  9

UNIT IV  MACHINING  9
Design considerations for: Turned parts – Drilled parts – Milled, planed, shaped and slotted parts–Ground parts.

UNIT V  ASSEMBLY  9

OUTCOME:
Upon completion of this course, the students will be able to:
- Gain technical competency in design modification of components / products with respect to manufacturability.

REFERENCES:
UNIT III  STRESS ANALYSIS  9
Stress in tubes – header sheets and pressure vessels – thermal stresses, shear stresses - types of failures, buckling of tubes, flow induced vibration.

UNIT IV  COMPACT AND PLATE HEAT EXCHANGER  9
Types- Merits and Demerits- Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations.

UNIT V  CONDENSERS AND COOLING TOWERS  9
Design of surface and evaporative condensers – cooling tower – performance characteristics.

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Apply the mathematical knowledge for thermal and stress analysis of various parts of the heat exchangers components.

TEXT BOOKS:

REFERENCES:

ME 7075  DESIGN OF PRESSURE VESSELS AND PIPING  L  T  P  C
3  0  0  3

OBJECTIVES:
- To apply the Mathematical knowledge gained in the design of pressure vessels and piping
- To carry out the stress analysis in pressure vessels and piping.

UNIT I  INTRODUCTION  9

UNIT II  STRESSES IN PRESSURE VESSELS  9
UNIT III  DESIGN OF VESSELS
Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design.

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

UNIT V  PIPING

OUTCOMES:
Upon completion of this course, the students will be able to:

- Apply the mathematical fundamentals for the design of pressure vessels and pipes.
- Analyse and design pressure vessels and piping.

TEXT BOOK:

REFERENCES:
UNIT IV THERMAL SYSTEMS

UNIT V ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems - Cooling Towers – D.G. sets

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Analyse the energy data of industries.
- Carry out energy accounting and balancing.
- Suggest methodologies for energy savings.

TEXT BOOK:

REFERENCES:

ME7077 ENTREPRENEURSHIP DEVELOPMENT

OBJECTIVE:
- The students will be provided with 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

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING
UNIT V  SUPPORT TO ENTREPRENEURS  9

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

TEXT BOOKS:

REFERENCES:

ME 7078  INTRODUCTION TO OPERATIONS RESEARCH  L  T  P  C
3  0  0  3

OBJECTIVE:
- To introduce the concepts in optimization of resources for manufacturing and service based industries.

UNIT I  LINEAR PROGRAMMING PROBLEMS  9
OR-Definition - Phases - models, LP problems formulation – Graphical solution, GLPP, Standard and Canonical forms of LPP- simplex methods- Big M, Two phase methods, Alternate optimal solutions, Duality in LP.

UNIT II  TRANSPORTATION  9
Transportation problems- Basic feasible solution, Optimal solution By MODI method, Balanced and Unbalanced TP, Degeneracy, Production problems. Assignment problems – Hungarian method Traveling salesman problems - Sequencing models- Johnson algorithm, n job 2 machines, n job 3 machines and n job m machines.

UNIT III  INVENTORY CONTROL  9
Types of inventory- Inventory cost - EOQ - Deterministic inventory problems – Purchase and Production models with and without shortages-EOQ with price breaks - Stochastic inventory problems - Multi product problems - Systems of inventory control (P and Q Systems)- Determination of buffer stock and re-order levels -Selective inventory control techniques (ABC, VED, SDE, etc.)

UNIT IV  QUEUING THEORY  9
Queueing system - Characteristics - symbols - Poisson process and exponential distribution -Single server queueing models - Multiserver queueing models, Simulation Monte Carlo technique- Inventory & Queuing problems.

UNIT V  PROJECT MANAGEMENT AND REPLACEMENT MODELS  9
Project management: Network logic – Ford-Fulkerson's rule - AON diagram - CPM and PERT techniques, Critical path and float calculations Replacement models -types of failures – Gradual failures-replacement of items: Efficiency deteriorates with time, sudden failures- individual and group replacement policies.

TOTAL:45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:
- Understand and apply the operations research techniques in industrial operations.

TEXT BOOKS:

REFERENCES:

ME 7079 LEAN SIX SIGMA

OBJECTIVE:
- To impart the knowledge of tools & techniques used in lean manufacturing and six sigma.

UNIT I  EVOLUTION AND OVERVIEW OF LEAN MANUFACTURING  9

UNIT II  LEAN MANUFACTURING – TOOLS AND TECHNIQUES  9
3Ms – Muda, Mura, Muri, 7 Wastes in Manufacturing, Lean Tools to eliminate Muda - 5S, Standardised work, TPM, SMED, Jidoka – Poka Yoke, JIT, Heijunka, Kanban, One piece production.

UNIT III  VALUE STREAM MAPPING  9
Need for Value Stream mapping; Steps involved in Value stream mapping – Choose value stream – PQ and PR analysis, Current State map, Lean Metrics, Future State Map, Kaizen plans; Lean implementation - Cultural change, Lean in the Supply chain.

UNIT IV  SIX SIGMA – TOOLS AND TECHNIQUES  9
Cost of Quality – Conformance and Non-Conformance cost, 7 Basic Quality Control Tools, Seven Management tools, FMEA.

UNIT V  SIX SIGMA METHODOLOGY  9
Need for Six Sigma, Six Sigma Team, DMAIC Methodology - Define, Measure, Analyse, Improve and Control; Lean Six Sigma.

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Apply the various tools, techniques and methodology of lean manufacturing and six sigma concepts to the potential quality gaps in manufacturing / production industries.

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TEXT BOOKS:
1. Pascal Dennis, "Lean production Simplified: A plain language guide to the world's most powerful Production system", Productivity Press 2007

REFERENCES:
2. Taichi Ohno, Toyota “Production System: Beyond Large-Scale Production”, Productivity Press 1988

ME 7080 MARKETING MANAGEMENT L T P C 3 0 0 3

OBJECTIVE:
- To expose the students to newer concepts of marketing principles like strategic marketing concepts, segmentation, pricing, advertisement and strategic formulation.

UNIT I CONCEPTS IN MARKETING 9

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9
Cultural, Demographic factors, Motives, Types, Buying Decisions, Segmentation factors, Demographic, Psycho graphic and Geographic Segmentation, Process, Patterns. Services marketing and Industrial marketing.

UNIT III PRODUCT, PRICE AND MARKETING RESEARCH 9

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Understand the philosophies of marketing and should able to formulate market planning strategies and could promote sales in effective manner.
TEXT BOOKS:

REFERENCES:

ME 7081 PROCESS PLANNING AND COST ESTIMATION  L  T  P  C
3 0 0 3

OBJECTIVE:
- To give an understanding of the fundamentals of Process Planning and estimation of appropriate costs of processes and products and applying these to manage competitive manufacturing systems and organisations.

UNIT I INTRODUCTION TO PROCESS PLANNING
Aims and Objectives, Place of process planning in Manufacturing cycle, Drawing interpretation, Dimensional tolerance vs Production processes.

UNIT II PROCESS PLANNING STEPS

UNIT III INTRODUCTION TO COST ESTIMATION
Importance, Types, Purpose, Components, Procedure, Classification of costs, Cost elements, Overhead expenses, Break-even analysis.

UNIT IV PRODUCTION COST ESTIMATION
Estimation of production cost for - Casting processes, Welding processes, and Forging processes.

UNIT V ESTIMATION OF MACHINING TIME AND COST
Estimation of Machining time – Lathe operations, Drilling, Milling, Shaping and Planing, and Grinding, Cost estimation for machining processes.

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Make logical, rational and economical process plans and realistic cost estimates of Components and Products.

TEXT BOOKS:
REFERENCES:

ME 7082 PRODUCT DESIGN AND DEVELOPMENT

OBJECTIVES:
• To understand the basic concepts of Product Design and Process Development.
• To appreciate the importance, various stages, concepts, management and prototyping of products.

UNIT I INTRODUCTION

UNIT II PRODUCT PLANNING, IDENTIFYING CUSTOMER NEEDS, PRODUCT SPECIFICATION
Product Planning Process: Identification of opportunities; evaluation and prioritization of projects; allocation of resources & plan timing; completion of pre-project planning. Identification of Customer Needs: Collection of raw data from customers; interpretation of raw data of customer needs; organization of the needs into a hierarchy; establishment of relative importance of needs. Product Specifications: Establishment of Target Specifications, Setting-up of Final Specifications.

UNIT III CONCEPT GENERATION, SELECTION, TESTING
Concept Generation: clarification of the problem; searching externally; searching internally, systematic exploration. Concept Selection: concept screening steps; concept scoring steps. Concept Testing: Defining the purpose of concept test; choosing a survey population; format; communicating the concept; measuring the customer response; interpretation of results.

UNIT IV PRODUCT ARCHITECTURE, INDUSTRIAL DESIGN, DESIGN FOR MANUFACTURE

UNIT V PROTOTYPING AND MANAGING PRODUCTS

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of this course, the students will be able to:
- Launch own ideas and the ideas of others, which would enable them to manage to work with innovation and development in large companies
- Apply new theories on innovation and change, including emerging paradigms such as user-driven innovation, open innovation and market forecasting in practice.

TEXT BOOK:

REFERENCES:

ME7083 SUSTAINABLE AND GREEN MANUFACTURING

OBJECTIVES:
- To inculcate the knowledge of sustainability in manufacturing.
- To learn the basis involved in Green manufacturing, recycling and life cycle assessment.

UNIT I INTRODUCTION TO SUSTAINABLE MANUFACTURING
Sustainable Manufacturing - Concept of Triple bottom line, Environmental, Economic and Social Dimensions of Sustainability, Sustainable Product Development – Various Phases.

UNIT II EVALUATING SUSTAINABILITY
Sustainability performance evaluators- Frameworks and techniques - environmental management systems - life cycle assessment - strategic and environmental impact assessments - carbon and water foot-printing.

UNIT III MANUFACTURING STRATEGY FOR SUSTAINABILITY

UNIT IV GREEN MANUFACTURING

UNIT V RECYCLING
Reclamation and recycling of waste- Recycling as Universal resource policy- Innovation towards environmental sustainability – systematic framework for conscious design- International green manufacturing standards and compliance.

TOTAL: 45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:

- Formulate strategy for sustainable manufacturing, implement green manufacturing, follow environmental norms in manufacturing and perform lifecycle assessment.

TEXT BOOKS:

REFERENCES:
6. Joseph Sarkis “Greener manufacturing and operations: from design to delivery and back” Greenleaf Pub., 2001

ME 7351 DESIGN CONCEPTS IN ENGINEERING

OBJECTIVES:
- To impart the importance of design in todays 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
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 modules in design process-scientific method and design method-Need identification, importance of problem definition-structured problem, real life problem- information gathering -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.

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:
Upon completion of this course, the students will be able to:
- Understand the various design requirements and processes involved in product development.
- Be exposed to various creativity and problem solving techniques.

TEXT BOOK:

REFERENCES:

ME 7603  DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

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

UNIT I  PRINCIPLES OF JIGS, FIXTURES AND PRESS WORKING

Objectives and importance of tool design—work holding devices—Basic elements of jigs and fixtures—location—clamping-indexing—operational chart—Fits and Tolerances

UNIT II  JIGS

Design and development of jigs for given component—Types of Jigs—Post, Turnover, Channel, latch, box, pot, angular post jigs—Indexing jigs.

UNIT III  FIXTURES

Design and development of fixtures for given component—General principles of milling, Lathe, boring, broaching and grinding fixtures—Assembly, Inspection and Welding fixtures—Modular fixturing systems—Quick change fixtures.
UNIT IV DESIGN OF CUTTING DIES
Complete design and preparation of standard views of simple blanking, piercing, compound and progressive dies - fine Blanking dies.

UNIT V DESIGN OF BENDING, FORMING, DRAWING AND MISCELLANEOUS DIES

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 will be able to:

- Design jigs, fixtures and press tools and give the assembly drawing with dimensions and Parts list.
- Use the above knowledge to design various types of dies and give the standard dimensioned views

TEXT BOOKS:

REFERENCES:

MF7071 ADDITIVE MANUFACTURING TECHNOLOGY

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

UNIT I INTRODUCTION
UNIT II DESIGN FOR ADDITIVE MANUFACTURING

UNIT III PHOTOPOLYMERIZATION AND POWDER BED FUSION PROCESSES

UNIT IV EXTRUSION BASED AND SHEET LAMINATION PROCESSES

UNIT V PRINTING PROCESSES AND BEAM DEPOSITION PROCESSES

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:

MF7651 NON-TRADITIONAL MACHINING PROCESSES

OBJECTIVES:
At the end of this course the students are expected to
• Understand the working principles of various non-traditional machining processes, their applications, advantages and limitations.
• The students can also able to learn advanced nano finishing processes, recent developments in the non-traditional machining processes and to compare them.
UNIT I  INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES  9
Introduction to non-traditional machining processes, need for non-traditional machining,
classification of non-traditional machining processes, their applications, advantages, limitations.
Abrasive jet machining, abrasive water jet machining, ultrasonic machining their working
principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT II  CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES  9
Chemical machining, electro-chemical machining, electro-chemical honing, electro-chemical
grinding, electro-chemical deburring their working principles, equipments, effect of process
parameters, applications, advantages and limitations.

UNIT III  THERMO-ELECTRIC ENERGY BASED PROCESSES  9
Electric discharge machining, wire electric discharge machining, laser beam machining, plasma
arc machining, electron beam machining, ion beam machining their working principles,
equipments, effect of process parameters, applications, advantages and limitations.

UNIT IV  ADVANCED NANO FINISHING PROCESSES  9
Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto
rheological finishing, magneto rheological abrasive flow finishing their working principles,
equipments, effect of process parameters, applications, advantages and limitations.

UNIT V  RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES  9
Recent developments in non-traditional machining processes, their working principles,
equipments, effect of process parameters, applications, advantages and limitations. Comparison
of non-traditional machining processes.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the students are expected to understand
1. The working principles of various non-traditional machining processes, their applications,
   advantages and limitations.
2. Advanced nano finishing processes.
3. Recent developments in the non-traditional machining processes.
4. Comparison of non-traditional machining processes.

TEXT BOOKS:

REFERENCES:
1. V. K. Jain, “Advanced Machining Processes”, Allied Publishers Pvt. Ltd., New Delhi,
   2002.
2. Serope Kalpakjian and Steven R. Schmid, “Manufacturing Engineering and Technology”,
   1987.
   Delhi,1980.
OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT  9

UNIT II  REQUIREMENTS AND SYSTEM DESIGN  9

UNIT III  DESIGN AND TESTING  9

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT  9

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY  9

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES: