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* Common to all B.E. / B.Tech. Programmes

+ Offering English Language Laboratory as an additional subject (with no marks) during 2\textsuperscript{nd} semester may be decided by the respective Colleges affiliated to Anna University Chennai.

A. CIRCUIT BRANCHES

I Faculty of Electrical Engineering
1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

II Faculty of Information and Communication Engineering
1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

B. NON – CIRCUIT BRANCHES

I Faculty of Civil Engineering
1. B.E. Civil Engineering

II Faculty of Mechanical Engineering
1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

III Faculty of Technology
1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
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## ELECTIVE - V

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## ELECTIVE - VI

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<td>Professional Ethics in Engineering</td>
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AIM:
To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:
- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I
Technical Vocabulary - meanings in context, sequencing words, Articles-Prepositions, intensive reading & predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:
1. Exercises on word formation using the prefix ‘self’ - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II

Suggested activities:
1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III
Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations.
Suggested activities:
1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object – verb / object – noun)
2. Speaking exercises involving the use of stress and intonation – Group discussions – analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.

UNIT IV

12
Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:
1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking: Role play – group discussions – Activities giving oral instructions.

UNIT V

9
Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:
1. Case Studies on problems and solutions
2. Brainstorming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TOTAL: 60 PERIODS

TEXT BOOK:

REFERENCES:
EXTENSIVE READING:

NOTE:
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA2161 MATHEMATICS – II

<table>
<thead>
<tr>
<th>UNIT I</th>
<th>ORDINARY DIFFERENTIAL EQUATIONS</th>
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<tbody>
<tr>
<td></td>
<td>Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.</td>
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<tr>
<th>UNIT II</th>
<th>VECTOR CALCULUS</th>
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<th>UNIT III</th>
<th>ANALYTIC FUNCTIONS</th>
<th>12</th>
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<td></td>
<td>Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.</td>
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<th>UNIT IV</th>
<th>COMPLEX INTEGRATION</th>
<th>12</th>
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<th>UNIT V</th>
<th>LAPLACE TRANSFORM</th>
<th>12</th>
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Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

PH2161 ENGINEERING PHYSICS – II L T P C 3 0 0 3

UNIT I CONDUCTING MATERIALS 9

UNIT II SEMICONDUCTING MATERIALS 9

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9
Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

UNIT V MODERN ENGINEERING MATERIALS 9
Metallic glasses: preparation, properties and applications.
Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

TOTAL: 45 PERIODS
TEXT BOOKS:
2. Charles P. Poole and Frank J. Owen, ‘Introduction to Nanotechnology’, Wiley India (2007) (for Unit V)

REFERENCES:

CY2161 ENGINEERING CHEMISTRY – II L T P C
3 0 0 3

AIM
To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES
• The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
• Principles of corrosion control
• Chemistry of Fuels and combustion
• Industrial importance of Phase rule and alloys
• Analytical techniques and their importance.

UNIT I ELECTROCHEMISTRY 9
Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nerst equation (problem) – reference electrodes – Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe²⁺ vs dichromate and precipitation – Ag⁺ vs Cl⁻ titrations) and conduct metric titrations (acid-base – HCl vs NaOH) titrations,

UNIT II CORROSION AND CORROSION CONTROL 9

UNIT III FUELS AND COMBUSTION 9
fuels - water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV PHASE RULE AND ALLOYS

UNIT V ANALYTICAL TECHNIQUES

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
moment – Varignon’s theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12

UNIT IV  DYNAMICS OF PARTICLES  12

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  12
Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I  BASIC CIRCUITS ANALYSIS  12

UNIT II  NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS:  12
Network reduction: voltage and current division, source transformation – star delta conversion.
Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III  RESONANCE AND COUPLED CIRCUITS  12

UNIT IV  TRANSIENT RESPONSE FOR DC CIRCUITS  12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V  ANALYSING THREE PHASE CIRCUITS  12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I  CIRCUIT ANALYSIS TECHNIQUES  12

UNIT II  TRANSIENT RESONANCE IN RLC CIRCUITS  12

UNIT III  SEMICONDUCTOR DIODES  12

UNIT IV  TRANSISTORS  12
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V  SPECIAL SEMICONDUCTOR DEVICES  (Qualitative Treatment only)  12

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING  L  T  P  C
(Common to branches under Civil, Mechanical and Technology faculty) 4  0  0  4

UNIT I  ELECTRICAL CIRCUITS & MEASUREMENTS  12
Ohm’s Law – Kirchoff’s Laws – Steady State Solution of DC Circuits – Introduction to
AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase
and Three Phase Balanced Circuits.

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

UNIT II  ELECTRICAL MECHANICS  12
Construction, Principle of Operation, Basic Equations and Applications of DC
Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III  SEMICONDUCTOR DEVICES AND APPLICATIONS  12
Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its
Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics –
Elementary Treatment of Small Signal Amplifier.

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

UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING  12
Types of Signals: Analog and Digital Signals – Modulation and Demodulation:
Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre
(Block Diagram Approach only).

TOTAL: 60 PERIODS

TEXT BOOKS:
   1990.

REFERENCES:
   (2005).
UNIT I  SURVEYING AND CIVIL ENGINEERING MATERIALS  15


UNIT II  BUILDING COMPONENTS AND STRUCTURES  15

Foundations: Types, Bearing capacity – Requirement of good foundations.


TOTAL: 30 PERIODS

UNIT III  POWER PLANT ENGINEERING  10


UNIT IV  IC ENGINES  10

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V  REFRIGERATION AND AIR CONDITIONING SYSTEM  10


TOTAL: 30 PERIODS

REFERENCES:
LIST OF EXPERIMENTS

1. UNIX COMMANDS
   Study of Unix OS - Basic Shell Commands - Unix Editor
   15

2. SHELL PROGRAMMING
   Simple Shell program - Conditional Statements - Testing and Loops
   15

3. C PROGRAMMING ON UNIX
   Dynamic Storage Allocation-Pointers-Functions-File Handling
   15

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware
- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software
- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

LIST OF EXPERIMENTS

1. Determination of Young’s modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
5. Spectrometer dispersive power of a prism.
6. Determination of Young’s modulus of the material – uniform bending.
   • A minimum of FIVE experiments shall be offered.
   • Laboratory classes on alternate weeks for Physics and Chemistry.
   • The lab examinations will be held only in the second semester.
LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using $\text{BaCl}_2$ vs $\text{Na}_2\text{SO}_4$
4. Potentiometric Titration ($\text{Fe}^{2+}$ / $\text{KMnO}_4$ or $\text{K}_2\text{Cr}_2\text{O}_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.

ME2155 COMPUTER AIDED DRAFTING AND MODELING LABORATORY

List of Exercises using software capable of Drafting and Modeling

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

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

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility - 30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

TOTAL: 45 PERIODS
LIST OF EXPERIMENTS

1. Verification of ohm’s laws and kirchoff’s laws.
2. Verification of Thévenin’s and Norton’s Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
10. Frequency response of single tuned coupled circuits.

TOTAL: 45 PERIODS

EC2155  CIRCUITS AND DEVICES LABORATORY  L T P C
0 0 3 2

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET

TOTAL: 45 PERIODS
1. **Listening:**
Listening & answering questions – gap filling – Listening and Note taking - Listening to telephone conversations

2. **Speaking:**
Pronouncing words & sentences correctly – word stress – Conversation practice.

**Classroom Session**
1. Speaking: Introducing oneself, Introducing others, Role play, Debate-
   Presentations: Body language, gestures, postures.
   Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

**Evaluation**
(1) Lab Session – 40 marks
   Listening – 10 marks
   Speaking – 10 marks
   Reading – 10 marks
   Writing – 10 marks

(2) Classroom Session – 60 marks
   Role play activities giving real life context – 30 marks
   Presentation – 30 marks

**Note on Evaluation**
1. Examples for role play situations:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

**REFERENCES:**

**LAB REQUIREMENTS**
1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.
OBJECTIVE
• To impart knowledge in the area of Method study and Time study so that students can implement these principles and techniques to improve productivity in manufacturing and Service sectors.

UNIT I  PRODUCTIVITY  9
Total time for a job or operation, total work content and ineffective time, – Production and Productivity - Productivity and standard of living, Factors affecting Productivity, Productivity measurement Models.

UNIT II  METHODS ENGINEERING  9
Methods Engineering-Steps -Tools and techniques, Motion study.

UNIT III  WORK MEASUREMENT  9

UNIT IV  APPLIED WORK MEASUREMENT  9
Work sampling, Group Timing Technique (GTT), predetermined time systems, types, Methods Time Measurement (MTM), Wage incentive plans.

UNIT V  WORK DESIGN FOR OFFICE WORK  9
Organization and methods (O & M), Work measurement of office work, Work Analysis techniques applied to support staff, Form design and control.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
OBJECTIVES
The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I  FOURIER SERIES  9 + 3

UNIT II  FOURIER TRANSFORMS  9 + 3

UNIT III  PARTIAL DIFFERENTIAL EQUATIONS  9 + 3

UNIT IV  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  9 + 3
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V  Z -TRANSFORMS AND DIFFERENCE EQUATIONS  9 + 3

LECTURES: 45  TUTORIALS : 15  TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE
To introduce the students the concepts of some basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and plastics component manufacture.

UNIT I  METAL CASTING PROCESSES

UNIT II  JOINING PROCESSES

UNIT III  BULK DEFORMATION PROCESSES

UNIT IV  SHEET METAL PROCESSES

UNIT V  MANUFACTURING OF PLASTIC COMPONENTS

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES

ME3205 MECHANICS OF MACHINES

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

UNIT I KINEMATIC OF MECHANICS 10

UNIT II GEARS and GEAR TRAINS 9

UNIT III FRICTION 8

UNIT IV FORCE ANALYSIS 9

UNIT V BALANCING AND VIBRATION 9
Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency –

**TEXT BOOKS:**

**REFERENCES:**

**STANDARDS:**

**CE3204 STRENGTH OF MATERIALS**

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**UNIT I**  
**STRESS, STRAIN AND DEFORMATION OF SOLIDS**

**UNIT II**  
**TRANVERSELOADING ON BEAMS AND STRESSES IN BEAMS**

**UNIT III**  
**TORSION**
Stresses and deformation in circular and hollows shafts – Stepped shafts – Shafts fixed at the both ends – Stresses in helical springs – Deflection of helical 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 energy method – 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 – deformation in thin cylinders – spherical shells subjected to internal pressure – deformations in spherical shells - Lame’s theory – application of theories of failure

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

IE3202 OPERATIONS RESEARCH – I L T P C
3 1 0 4

OBJECTIVE:
To learn the basics of deterministic optimization tools

UNIT I  LINEAR PROGRAMMING 10

UNIT II  ADVANCES IN LPP - I 10

UNIT III  ADVANCES IN LPP - II 6
Integer Linear programming formulations, graphical solution of the LP relaxation, Graphical solution to all integer problem, applications involving 0-1 variables, introduction to cutting plane and branch & bound methods – Multi objective optimization - Goal programming problem formulation.

UNIT IV  NETWORK MODELS 12
UNIT V  DYNAMIC PROGRAMMING
Elements of dynamic programming – stage and state, characteristics of DP
problems, recursive relationship, Bellman’s principle of optimality – computational
procedure for shortest route problem, knapsack problem, production and inventory
control problem.

L: 45, T: 15, TOTAL : 60PERIODS

TEXT BOOKS

REFERENCES
   India, 2003
   Quantitative approaches to Decision Making, Thomson, 2003

ME3209  MANUFACTURING TECHNOLOGY LAB-I  L T P C
0 0 3 2

AIM:
To have knowledge on common basic machining operations

OBJECTIVES:
To study and practice the various operations that can be performed in lathe, shaping,
drilling, milling etc. and equip with the practical knowledge required in the core
industries.

LIST OF EXPERIMENTS
Measurement of the Machined Components and Machining time estimation of:
1. Taper Turning
2. External thread cutting
3. Internal thread cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping
8. Drilling and Tapping

TOTAL: 45 PERIODS
OBJECTIVE:
To understand the theory better and apply in practice, practical training is given in the following areas

1. Graphic tools for method study
2. Peg board experiment
3. Stop watch time study
4. Performance rating exercise
5. Work sampling
6. MTM practice

TOTAL: 30 PERIODS

OBJECTIVES:
- To understand the various mechanical properties by conducting tensile test.

1. To understand the hardness value of different materials
2. Tension test on mild steel / tor steel rod
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen
6. Hardness test on metals
7. Compression test on helical spring
8. Deflection test on carriage spring

TOTAL: 45 PERIODS

OBJECTIVES:
- The students will have a fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomenon.
- Have the notion of sampling distributions and statistical techniques used in management problems.
UNIT I  RANDOM VARIABLES  9 + 3
Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions - Functions of random variable.

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES  9 + 3
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables-Linberg Levy central limit theorem

UNIT III  TESTING OF HYPOTHESIS  9 + 3

UNIT IV  DESIGN OF EXPERIMENTS  9 + 3
Completely randomized design – Randomized block design – Latin square design - \( 2^2 \)-factorial design.

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

L: 45, T: 15, TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
- The applications of the conservation laws to flow through pipes and hydraulics machines are studied

UNIT I

INTRODUCTION

Units & Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics: concepts of system and control volume. Application of control volume to continuity equation, energy equation, momentum equation and moment of momentum equation.

UNIT II

FLOW THROUGH CIRCULAR CONDUITS


UNIT III

DIMENSIONAL ANALYSIS

Dimension and units: Buckingham’s Π theorem. Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.

UNIT IV

ROTO DYNAMIC MACHINES


UNIT V

POSITIVE DISPLACEMENT MACHINES


TOTAL: 60 PERIODS

TEXT BOOKS:

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

UNIT I  STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS
Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties -- Preferred numbers, fits and tolerances -- Direct, Bending and torsional stress equations -- Impact and shock loading -- calculation of principle stresses for various load combinations, eccentric loading -- Design of curved beams -- crane hook and ‘C’ frame - Factor of safety - theories of failure -- stress concentration -- design for variable loading -- Soderberg, Goodman and Gerber relations

UNIT II  DESIGN OF SHAFTS AND COUPLINGS
Design of solid and hollow shafts based on strength, rigidity and critical speed -- Design of keys, key ways and splines - Design of crankshafts -- Design of rigid and flexible couplings.

UNIT III  DESIGN OF TEMPORARY AND PERMANENT JOINTS
Threaded fastners - Design of bolted joints including eccentric loading, Knuckle joints, Cotter joints -- Design of welded joints, riveted joints for structures - theory of bonded joints.

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

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

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

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

TEXT BOOKS
REFERENCES

STANDARDS

ME 2252 MANUFACTURING TECHNOLOGY – II

OBJECTIVE
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) machine tool and CNC programming.

UNIT I THEORY OF METAL CUTTING 9

UNIT II CENTRE LATHE AND SPECIAL PURPOSE LATHES 9
Centre lathe, constructional features, cutting tool geometry, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes – automats – single spindle, Swiss type, automatic screw type, multi spindle - Turret Indexing mechanism, Bar feed mechanism.

UNIT III OTHER MACHINE TOOLS 9

UNIT IV ABRASIVE PROCESSES AND GEAR CUTTING 9
UNIT V  
CNC MACHINE TOOLS AND PART PROGRAMMING


TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES:
AIM:
- To impart the importance of thermal science aspects in the field of manufacturing engineering.

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

UNIT I  BASIC CONCEPTS OF THERMODYNAMICS

UNIT II  FIRST AND SECOND LAW OF THERMODYNAMICS

UNIT III  HEAT ENGINES

UNIT IV  GASES AND VAPOUR MIXTURES

UNIT V  HEAT TRANSFER

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To impart knowledge in the areas of cost estimation, pricing of products, cost control methods and principles of accounting.
- After undergoing the course, the students will be able to estimate cost of products, analyze product cost and suggest cost reduction measure.

UNIT I INTRODUCTION

UNIT II PRODUCTION ANALYSIS AND PRICING
Production Function-Least Cost Combination of Inputs-Factor Productivities & Return to Scale-Determinants of Price-Pricing under different objectives and Market Structures-Price Discrimination & Pricing methods in practice.

UNIT III ESTIMATION
Estimation of Material, Labor and Overhead Cost, Allocation of Overheads. Estimation for different types of jobs.

UNIT IV COSTING
Job Costing-Operating Costing-Process Costing- Standard Costing (Variance Analysis)

UNIT V ACCOUNTING
Balance Sheet-Profit & Loss Statement-Evaluation of Investment decisions- Average Rate of Return-Payback Period-Net Present Value & IRR.

TEXT BOOKS:
1. Jawaharlal, Cost Accounting, TMH, 1996

REFERENCES:
AIM:
To perform experiments on various types of pumps and turbines to understand their characteristics.

OBJECTIVES:
- To understand the concepts of flow through different cross sections.
- To understand and draw characteristics of various pumps.
- To understand and draw performance characteristics of different turbines.

UNIT I  FLOW MEASUREMENT

UNIT II  PUMPS
Determination of performance characteristics of pumps – centrifugal pumps, submersible pumps, turbine pumps and positive displacement pumps – reciprocating and gear pumps.

UNIT III  TURBINES
Determination of performance characteristics of turbines – reaction turbines and impulse turbines.

REFERENCE:
1. CWR, Hydraulics Laboratory Manual, 2004

TOTAL: 45 PERIODS

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AIM:
To acquire skills on common basic machining operations and press working.

OBJECTIVES:
To study and practice the basic machining operations in the special purpose machines and acquire its applicability in the real time components manufacturing industries.

LIST OF EXPERIMENTS
1. Contour Milling using vertical milling machine
2. Gear Cutting using milling machine
3. Gear Hobbing
4. Gear Shaping
5. Hexagonal Machining using Horizontal Milling Machine
6. Gear Cutting – Gear Shaping
7. Spline Broaching
8. Exercise in Surface Grinding
9. Exercise in Cylindrical Grinding
10. Exercise in Tool and Cutter Grinder
11. Spur and helical gear cutting in Milling Machine
12. Determination of cutting forces in Milling Machine
13. Study of Turret and Capstan lathe
14. Forming of Simple Components in Press Working and simple Calculations of sheet metal work

TOTAL : 45 PERIODS

IE3301 PRINCIPLES OF MANAGEMENT L T P C 3 0 0 3

OBJECTIVE:
• To explain the basic principles of management, namely, Planning, Organizing, Staffing, Leading and Controlling and application of these principles in any given organization.

UNIT I PLANNING 9

UNIT II ORGANIZING 9
Nature and Purpose of Organizing – Basic Departmentation – Line/Staff Authority and Decentralization – Effective Organization and Organizational Culture.

UNIT III STAFFING 9
HRM and Selection - Performance Appraisal & Wages Strategy – Manager and Organization Development.

UNIT IV LEADING 9

UNIT V CONTROLLING 9

TOTAL: 45 PERIODS
IE3302 OPERATIONS RESEARCH – II L T P C
3 1 0 4

OBJECTIVE:
To impart knowledge on some probabilistic optimization techniques

UNIT I DETERMINISTIC INVENTORY MODELS
Purchase model with no shortages – manufacturing model with no shortage –
Purchase model with shortage – Manufacturing model with shortages –model with
price breaks

UNIT II PROBABILISTIC INVENTORY MODELS
Probabilistic inventory model – Reorder point model – multi product-Selective
Inventory control.

UNIT III QUEUING THEORY
Queueing theory terminology – Single server, multi server, Limited queue capacity –
aplications – Markov chains

UNIT IV DECISION THEORY
Decision making under certainty – Decision making under risk – Decision making
under uncertainty – Decision tree analysis – MCDM – AHP. Game Theory - Two
person zero sum games, pure and mixed strategies – graphical solution – solving by
LP.

UNIT V REPLACEMENT MODELS
Replacement models – Money value, present worth factor and discount rate.

TOTAL: 60 PERIODS

REFERENCES
Quantitative approaches to Decision Making, Thomson,2003

IE3303 STATISTICAL QUALITY CONTROL L T P C
4 0 0 4

OBJECTIVE
- This course is concerned with the applications of statistical tools in measuring
  and controlling the quality of products/processes
UNIT I  QUALITY FUNDAMENTALS  5
Importance of quality, meaning of quality, quality dimensions, quality planning, quality control, SQC, Quality assurance, quality costs, economics of quality, quality and productivity, quality and reliability, quality loss function.

UNIT II  CONTROL CHARTS FOR VARIABLES  10
Process variation, Statistical basis, 3 – sigma control limits, Rational sub-grouping, \( \bar{x} \), R and S charts, Interpretation of charts, warning and modified control limits, operating characteristic curve for \( \bar{x} \) – chart, SPC -process capability analysis – \( C_p \), \( C_{pk} \), \( C_{pm} \), Machine capability, Gauge capability.

UNIT III  CONTROL CHARTS FOR ATTRIBUTES  10
P, np, C, U and ku charts, demerits control chart, Multi – variable chart, individual measurement charts – moving average and moving range charts, quality control in service sector.

UNIT IV  ACCEPTANCE SAMPLING  10
Need for Acceptance sampling, economics of sampling, sample selection, single and Double sampling – O.C. curves, Average outgoing quality (AOQ), Average sample number (ASN), Average total inspection (ATI), Multiple and sequential sampling, sampling plans – military standards, Dodge – Roming, IS 2500.

UNIT V  METROLOGY & INSPECTION  10

L : 45  T:15   TOTAL: 60 PERIODS

TEXT BOOK :

REFERENCES :

IE3304  APPLIED ERGONOMICS  L T P C
3 0 0 3

OBJECTIVE
To explain the general principles that govern the interaction of humans and their working environment for improving worker performance and safety.

UNIT I  INTRODUCTION  3
Brief history of human factors engineering/Ergonomics – Interdisciplinary nature.

UNIT II  HUMAN PERFORMANCE:  10
UNIT III    PHYSIOLOGICAL ASPECTS OF HUMAN AT WORK     12
Metabolism – Physiological factors involved in muscular activity – Measurement of
energy expenditure – Quantitative work load analysis - Physical work capacity and its
evaluation – Physiological fatigue – Work and rest schedules – Physical fitness tests.

UNIT IV    WORK PLACE DESIGN:     12
Problems of body size, Anthropometry measures, Work posture - Work space
layout and work station design – Design of displays, controls and VDT work stations
- Hand tool design, illumination.

UNIT V    OCCUPATIONAL HEALTH AND SAFETY     8
Industrial accidents, Personal Protective devices, Safety Management practices –
Effect of Environment – heat, cold & noise – NIOHS regulations and Factories Act

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES

IE3305    MANUFACTURING AUTOMATION   L T P C
3 0 0 3

OBJECTIVE
To give a brief exposure to automation principles and applications to production
systems covering few types of automation.

UNIT I    MANUFACTURING OPERATIONS     9
Automation in production systems, principles and strategies, Product/production
relationships, Production concepts and mathematical models, Costs of manufacturing
operations.

UNIT II    CONTROL TECHNOLOGIES       9
Automated systems – elements, functions, levels, Continuous Vs discrete control,
Computer process control, Sensors, Actuators, ADC, DAC, Programmable logic
controllers – ladder logic diagrams.

UNIT III   NUMERICAL CONTROL AND ROBOTICS    9
NC - CNC – Part programming – DNC – Adaptive control – Robot anatomy –
Specifications – End effectors – Industrial applications

UNIT IV    AUTOMATED HANDLING AND STORAGE   9
Automated guided vehicle systems – AS/RS – carousel storage, Automatic data
capture- Bar coding technology.

UNIT V    COMPUTER-AIDED DESIGN        9

Fundamentals of CAD – design process, manufacturing database – Computer graphics – functions, constructing the geometry, transformation, wire frame Vs solid modelling.

**TOTAL : 45 PERIODS**

**REFERENCES**

**IE3306  AUTOMATION LABORATORY  L T P C**

1. Part programming for CNC lathe
2. Simulation and machining practice in CNC lathe
3. Part programming for CNC Milling machine
4. Practice in CNC milling machine
5. Programming exercise for robot
6. Programming of PLC using ladder logic diagram
7. Experiments using PLC.

**TOTAL : 45 PERIODS**

**IE3307  ERGONOMICS LAB  L T P C**

**OBJECTIVE:**
To provide hands on experience in some areas of Ergonomics

1. Effect of speed of walking on treadmill using heart rate and energy expenditure
2. Effect of workload on heart rate using Ergo cycle.
3. Evaluation of physical fitness using step test
4. Effect of work-rest schedule on physical performance (Ergo cycle / tread mill)
5. Development of anthropometric data for male and female.
6. Application of anthropometric data for the design of desk for students
7. Evaluation of physical facilities (chairs, tables etc.) through comfort rating.
8. Evaluation of cognitive performance of individuals
9. Analysis of noise level in different environments
10. Study of Illumination at work places.

**TOTAL : 30 PERIODS**

**IE3308  TECHNICAL SEMINAR  L T PC**
To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

**TOTAL : 30 PERIODS**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>L T P C</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 3351</td>
<td>MULTI VARIATE STATISTICAL ANALYSIS</td>
<td>3 0 0 3</td>
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</tbody>
</table>

**OBJECTIVE:**
To impart knowledge on applications of Multi Variate Statistical analysis.

**UNIT I**  **REGRESSION AND CORRELATION**  9
Simple Regression, and Correlation – estimation using the regression line, correlation analysis, Multiple Regression and Canonical Correlation analysis – finding the multiple regression equation, modeling techniques, Making inferences about population parameters

**UNIT II**  **MULTIVARIATE NORMAL**  9
An overview of multivariate methods, Multivariate normal distribution, Eigen values and Eigen vectors

**UNIT III**  **FACTOR ANALYSIS**  9
Principal components analysis – objectives, estimation of principal components, testing for independence of variables, Factor analysis model – factor analysis equations and solution

**UNIT IV**  **DISCRIMINANT ANALYSIS**  9
Discriminant analysis – discrimination for two multi variate normal populations- Discriminant rules –Discriminant Functions.

**UNIT V**  **CLUSTER ANALYSIS**  9
Cluster analysis – clustering methods, Multivariate analysis of variance

**TEXT BOOK:**

**REFERENCE:**
To provide some aspects of Fixed, Flexible and integrated automation along with their applications

UNIT I GT AND FMS 9
Part families, production flow analysis, cellular manufacturing, ROC, Flexible manufacturing systems- components, FMS applications, FMS analysis – bottleneck model.

UNIT II TRANSFER LINES 9
Automated production lines – applications, Analysis – with and without buffers automated assembly systems, line unbalancing concept.

UNIT III MANUFACTURING SUPPORT SYSTEMS 9
Product design and CAD, CAD/CAM and CIM, Computer aided process planning- variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.

UNIT IV FUNDAMENTALS OF COMMUNICATIONS 9
Information, Communications matrix, Computer communications, Network architecture, Tools and techniques.

UNIT V DATABASE AND CIM MANAGEMENT 9
Manufacturing data, database technology, Database management, Management OF CIM – role, cost justification, expert systems

TOTAL: 45 PERIODS

REFERENCES:
2. S.Kant Vajpayee, Principles of Computer-Integrated Manufacturing, PHI, 2005

IE3353 RELIABILITY ENGINEERING L T P C 3 0 0 3

OBJECTIVE:
To cover the basic concepts of reliability, reliability estimation, and reliability management

UNIT I RELIABILITY CONCEPTS 6

UNIT II FAILURE DATA MODELING: 13

UNIT III RELIABILITY PREDICTION AND MODELING: 13
UNIT IV  RELIABILITY MANAGEMENT:  8

UNIT V  RISK ASSESSMENT:  5

REFERENCES:

IE3354  FACILITY LAYOUT AND MATERIAL HANDLING  L T P C
3 0 0 3

OBJECTIVE
To explain the basic principles in facilities planning, location, layout designs and material handling systems

UNIT I  FACILITY LOCATION  12

UNIT II  FACILITY LAYOUT DESIGN  9
Need for Layout study, Factors influencing plant layout, Objectives of a good facility layout, Classification of layout, Layout procedure – Nadler’s ideal system approach, Immer’s basic steps, Apple’s layout procedure, Reed’s layout procedure – Layout planning – Systematic Layout Planning – Information gathering, flow analysis and activity analysis, relationship diagram, space requirements and availability, designing the layout. Utilities planning

UNIT III  COMPUTERISED LAYOUT PLANNING  9

UNIT IV  DESIGNING PRODUCT LAYOUT  6
Line balancing - Objectives, Line balancing techniques – Largest Candidate rule-Kilbridge and Wester method- RPW method- COMSOAL.

UNIT V  MATERIAL HANDLING AND PACKAGING  9
Objectives and benefits of Material handling, Relationship between layout and Material handling, Principles of material handling, Unit load concept, Classification of material handling equipments, Equipment selection, Packaging.

**TEXT BOOK:**

**REFERENCES:**

IE3356 PRODUCTION SYSTEM DESIGN PROJECT

OBJECTIVE:
- To apply the concepts of various techniques covered in the areas of Industrial Engineering in a given practical situation.

Projects shall be assigned in the following areas:
- Forecasting and Aggregate Planning
- Materials Requirement Planning and Capacity Planning
- Transportation and Distribution of goods
- Group technology and Cellular manufacturing
- Production and Project Scheduling
- Quality Control
- Plant Layout Design
- Methods improvement in manufacturing and service organisation

TOTAL: 90 PERIODS

IE3357 STATISTICAL APPLICATIONS AND OPTIMIZATION LAB

OBJECTIVE:
- To give adequate exposure to applications of software packages in the areas of Applied Statistics, Operations Research and Reliability

UNIT-I Basic Statistics
1. Mean, Median, Mode, measures of dispersion

UNIT-II Use of Spreadsheet
2. Look up tables, Statistics

UNIT-III Use of RELIASOFT
3. Data analysis

UNIT-IV Simple Operation Research Programs
4. Initial Solution of TP, Inventory Price Break Models
Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students’ overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session (Weightage 40%) 24 periods

A. ENGLISH LANGUAGE LAB (18 Periods)

1. LISTENING COMPREHENSION: (6)
   Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

2. READING COMPREHENSION: (6)
   Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: (6)
Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)
(Samples are available to learn and practice)

1. **RESUME / REPORT PREPARATION / LETTER WRITING** (1)
   Structuring the resume / report - Letter writing / Email Communication - Samples.

2. **PRESENTATION SKILLS:** (1)
   Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. **SOFT SKILLS:** (2)
   Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. **GROUP DISCUSSION:** (1)
   Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD - Video samples

5. **INTERVIEW SKILLS:** (1)
   Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

<table>
<thead>
<tr>
<th>II. Practice Session</th>
<th>(Weightage – 60%)</th>
<th>24 periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Resume / Report Preparation / Letter writing: Students prepare their own resume and report.</td>
<td>(2)</td>
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<tr>
<td>2. Presentation Skills: Students make presentations on given topics.</td>
<td>(8)</td>
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<tr>
<td>3. Group Discussion: Students participate in group discussions.</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>4. Interview Skills: Students participate in Mock Interviews</td>
<td>(8)</td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS

REFERENCES
LAB REQUIREMENT

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

Requirement for a batch of 60 students

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Server</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>- PIV system</td>
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<tr>
<td></td>
<td>- 1 GB RAM / 40 GB HDD</td>
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</tr>
<tr>
<td></td>
<td>- OS: Win 2000 server</td>
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<tr>
<td></td>
<td>- Audio card with headphones (with mike)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- JRE 1.3</td>
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<tr>
<td>2.</td>
<td><strong>Client Systems</strong></td>
<td>60 No.</td>
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<tr>
<td></td>
<td>- PIII or above</td>
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<tr>
<td></td>
<td>- 256 or 512 MB RAM / 40 GB HDD</td>
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</tr>
<tr>
<td></td>
<td>- OS: Win 2000</td>
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<tr>
<td></td>
<td>- Audio card with headphones (with mike)</td>
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<tr>
<td></td>
<td>- JRE 1.3</td>
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<tr>
<td>3.</td>
<td><strong>Handicam Video Camera (with video lights and mic input)</strong></td>
<td>1 No.</td>
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<tr>
<td>4.</td>
<td><strong>Television - 29”</strong></td>
<td>1 No.</td>
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<tr>
<td>5.</td>
<td><strong>Collar mike</strong></td>
<td>1 No.</td>
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<tr>
<td>6.</td>
<td><strong>Cordless mikes</strong></td>
<td>1 No.</td>
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<tr>
<td>7.</td>
<td><strong>Audio Mixer</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td>8.</td>
<td><strong>DVD Recorder / Player</strong></td>
<td>1 No.</td>
</tr>
</tbody>
</table>
OBJECTIVE:
To impart knowledge on statistical tools for industrial experimentation related to selection of product and process parameters in various environments.

UNIT I CONCEPTS AND TERMINOLOGY
Review of hypothesis testing – P Value, “t” Vs paired “t” test, simple comparative experiment, planning of experiment – steps. Terminology - factors, levels, variables, Design principles – replication, randomization, blocking, confounding, Analysis of variance, sum of squares, degrees of freedom.

UNIT II SINGLE FACTOR EXPERIMENTS
Completely randomized design, Randomized block design, effect of coding the observations, Latin Square design, orthogonal contrasts, comparison of treatment means – Duncan’s multiple range test, Newman- Keuel’s test, Fisher’s LSD test, Tukey’s test.

UNIT III FACTORIAL EXPERIMENTS
Main and interaction effects. Rules for sum of squares and expected mean square, two and three factor full factorial design, $2^k$ designs with two and three factors, Hate’s algorithm, practical applications.

UNIT IV SPECIAL EXPERIMENTAL DESIGNS
Blocking and confounding in $2^k$ design, nested design, split – plot design, two level fractional factorial design, fitting regression models, introduction to response surface methods- Central composite design.

UNIT V TAGUCHI TECHNIQUES
Introduction, Orthogonal designs, data analysis using ANOVA and response graph, parameter design – noise factors, objective functions (S/N ratios), multi-level factor OA designs, applications.

TOTAL : 45 +15 = 60 PERIODS

TEXT BOOK :
1. Douglos C.Montgomery, Design and Analysis of Experiments, John Wiley & Sons,2005

REFERENCES :
Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

UNIT IV TQM TOOLS & TECHNIQUES II 9

UNIT V QUALITY SYSTEMS 9

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

IE3402 SIMULATION MODELING AND ANALYSIS L T P C
3 0 0 3

OBJECTIVE:
To cover various aspects of discrete dynamic, stochastic systems modeling and conducting experiments with those models on a computer.

UNIT I INTRODUCTION 3
Systems – Modelling – types – systems components – Simulation basics

UNIT II RANDOM NUMBERS/VARIATES 10
Random numbers – methods of generation – random variates for standard distributions like uniform, exponential, Poisson, binomial, normal etc – Testing of Random variates – Monte Carlo Simulation

UNIT III DESIGN OF SIMULATION EXPERIMENTS 12
Steps on Design of Simulation Experiments – Development of models using of High-level language for systems like Queuing, Inventory, Replacement, Production etc., – Model validation and verification, Output analysis.
UNIT IV  SIMULATION LANGUAGES  12
Need for simulation Languages – Comparisons & Selection of Languages – GPSS-
ARENA- EXTEND – Study of any one of the languages

UNIT V  CASE STUDIES USING SIMULATION LANGUAGES  8

TOTAL: 45 PERIODS

REFERENCES
1. Jerry Banks, John S Corson, Barry L. Nelson, David M. Nicol and
   P. Shahabudeen, Discrete Event Systems Simulation, Pearson education,
3. Law A. M & Kelton W D, Simulation Modelling and analysis, Tata McGraw-
   Hill, 2003
4. David Kelton, Rondall P Sadowski, David T Sturrock, Simulation with
   Arena, Mc Graw Hill, 2004
   http://www.bcnn.net

IE3403  OPERATIONS SCHEDULING  L T P C
3 0 0 3

OBJECTIVE:
To impart knowledge on various scheduling techniques applicable to Job shop, Flow
shop configurations.

UNIT I  SCHEDULING AND SEQUENCING  6
Scheduling function – Scheduling theory – Sequencing and scheduling objectives –
Tardiness- In process inventory – SPT, EDD, WSPT – Regular measure of
performance- Sequencing theorems.

UNIT II  SINGLE MACHINE MODEL  10
Minimization of number of tardy jobs: Hodgson’s algorithm – Minimizing mean flow
time: Smith’s rule – Minimizing mean tardiness: Wilkerson Irwin algorithm – Dynamic
programming approach – Branch and Bound algorithm – Neighbourhood search
technique – Non simultaneous arrivals – Minimizing mean tardiness for dependent
jobs – Minimizing weighted mean flow time: Horn’s method, Sidney’s algorithm-
Sequence dependent set up times.

UNIT III  PARALLEL MACHINE MODEL  8
Independent jobs: McNaughton’s algorithm for makespan minimization– Heuristic
procedures to minimize mean flow time and makespan – Minimizing mean
weighted flow time: $H_i$ heuristic and $H_m$ heuristic– Dependent jobs: Hu’s algorithm
– Muntz Coffman algorithm.

UNIT IV  FLOW SHOP MODEL  10
Characteristics – Johnson’s algorithm – Extension of Johnson’s rule – Campbell
Dudek Smith algorithm – Palmer’s heuristic approach – Start lag, Stop lag – Mitten’s
algorithm – Ignall Schrage algorithm - Despatch index heuristic
UNIT V  JOB SHOP MODEL

REFERENCES:

IE 3404  DISCRETE SIMULATION LABORATORY
OBJECTIVE
To give hands on experience with reference to computer based discrete system simulation experiments
1. Random Number Generation
   Mid Square, Constant Multiplier, Congruential
2. Random variates Generation
   Exponential, Poisson, Normal, Binomial
3. Testing of Random variates
   Chi-Square, KS, Run
4. Monte Carlo Simulation
   Random Walk Problem
5. Queuing Models
   Single, Multi Server
6. Other IE oriented models
   Inventory, Replacement, Production system etc
7-10 Use of Simulation Language/Packaage

TOTAL: 45 PERIODS

IE3405  COMPREHENSION
AIM:
To give a comprehensive knowledge and understanding in the various fields of Industrial Engineering
The objective of this comprehension is to achieve an understanding of the fundamentals of contemporary manufacturing systems including materials, manufacturing process, product and process control, computer integrated manufacture and quality. The students work in groups and solve a variety of problems given to them. The problems given to the students should be of real like
industrial problems selected by a group of faculty members of the concerned department. A minimum of three small problems have to be solved by each group of students. The evaluation is based on continuous assessment by a group of Faculty Members constituted by the professor in-charge of the course.

TOTAL: 30 PERIODS

IE3451    PROJECT WORK    L T P C
          0 0 12 6

A Project topic must be selected either from published lists or the students themselves may propose suitable topics 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 manufacture of a device, a research investigation, a computer or management project or a design problem.

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.

IE3004    INFORMATION SYSTEMS ANALYSIS AND DESIGN    L T P C
          3 0 0 3

OBJECTIVE:
To impart knowledge on the basics of systems analysis and design required for developing application software in a given environment.

UNIT I    OVERVIEW
Information and Management - types of information, Examples of Information systems, Information Systems analysis overview, Information gathering - sources

UNIT II   DATA FLOW DIAGRAMS
System Requirements specifications, Feasibility analysis, Data flow diagrams – logical and physical DFDs, Process specification methods, Decision tables
UNIT III ER DIAGRAMS
Logical database design – ER model, Normalizing relations; Data input methods; Database Management Systems – database design, Object oriented systems modeling

UNIT IV E-COMMERCE
Designing outputs, Security of Information systems, E-commerce

UNIT V APPLICATIONS
System design example: Document and data flow diagrams, Feasibility of the system, System specifications, Database design, Control, audit and test plan

REFERENCES:
1. V. Rajaraman, Analysis and Design of Information Systems, PHI, 2004

IE3005 ADVANCED OPTIMIZATION TECHNIQUES L T P C 3 0 0 3

OBJECTIVE
Some of the Operations Research techniques which are not covered in the first level course are dealt with.

UNIT I MULTI CRITERIA MODELS
Data Envelopment Analysis, Multicriteria Decision Problems- Goal Programming, Analytic Hierarchy Process

UNIT II NON–LINEAR MODELS –I
Types of Non-linear programming problems, unconstrained optimization, Linearly Constrained Optimization, Quadratic Programming, Convex Programming,

UNIT III NON–LINEAR MODELS –II
KKT conditions for constrained optimization, Separable programming, Non-convex programming, Geometric programming

UNIT IV MARKOV PROCESSES
Markov Processes, Neural network based optimization

UNIT V METAHEURISTICS

TOTAL: 45 PERIODS

REFERENCES:
OBJECTIVE

- A brief introduction to algorithmic design tools with some applications

UNIT I  INTRODUCTION  5
Review of C/C++ - writing and debugging large programs-controlling numerical errors

UNIT II  ALGORITHM DESIGN METHODS  12

UNIT III  BASIC TOOLS  12
Structured approach – networks – trees – data structures

UNIT IV  COMPUTATIONAL PERFORMANCE  6
Time complexity – space complexity – algorithm complexity

UNIT V  APPLICATIONS  10
Sorting – searching - net works – scheduling – optimisation models – IE applications

TOTAL : 45 PERIODS

REFERENCES:
3. Dromey, R.G., How to solve it with computers?, PHI, 2002

OBJECTIVE:
To impart knowledge on basics of DSS and Knowledge based systems

UNIT I  INTRODUCTION  5
Managerial decision making, system modeling and support-preview of the modeling process-phases of decision making process.

UNIT II  ANALYSIS  10
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III  TECHNOLOGIES  10
Group support systems- enterprise DSS- supply chain and DSS-knowledge management methods, technologies and tools.
UNIT IV EXPERT SYSTEMS 10
Artificial intelligence and expert systems-concepts, structure, types-knowledge acquisition and validation-difficulties, methods, selection.

UNIT V SEMANTIC NETWORKS 10
Representation in logic and schemas, semantic networks, production rules and frames, inference techniques, intelligent system development, implementation and integration of management support systems.

TOTAL: 45 PERIODS

REFERENCES

IE3011 EVOLUTIONARY OPTIMIZATION L T P C
3 0 0 3

OBJECTIVE
To cover some of the evolutionary algorithms and their applications in optimization

UNIT I INTRODUCTION 9
Introduction to evolutionary computation, Evolutionary computation and AI, Historical branches of evolutionary computation

UNIT II SEARCH SCHEMA 9
Search operators, Selection schemes, Ranking methods, Importance of representation

UNIT III EVOLUTIONARY ALGORITHMS 9
Evolutionary combinatorial optimization – evolutionary algorithms, Constraint handling

UNIT IV GENETIC PROGRAMMING 9
Genetic programming – steps, Search operators on trees, examples

UNIT V MULTIOBJECTIVE OPTIMISATION 9
Pareto optimality, Multiobjective evolutionary algorithms, Analysis of evolutionary algorithms

TOTAL : 45 PERIODS

REFERENCES:
OBJECTIVE:
- To cover the basics of systems engineering study steps and associated techniques in the systems analysis.

UNIT I  INTRODUCTION  6
Definitions, Systems theory, Life-Cycle phases, Systems Engineering processes, Seven-phase and twenty-two phase life cycle for systems acquisition.

UNIT II  FORMULATION OF ISSUES  9
Problem or Issue identification, Formulation of issues with an example – Identification of needs, alterables, constraints, Value system design, Requirements statement, Generation of Alternatives or System synthesis, Feasibility studies.

UNIT III  ANALYSIS OF ALTERNATIVES  12
Analysis of systems with uncertain and imperfect information, structural modeling – trees, causal loops, and influence diagrams, system dynamics models, Economic models, Reliability models, Discrete event models.

UNIT IV  DECISION ASSESSMENT  9
Interpretation of alternative courses of action, Formal Decisions – prescriptive and normative decision assessments, Descriptive decision models – Group decision making.

UNIT V  SYSTEMS ENGINEERING MANAGEMENT  9

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES:
UNIT I  INTRODUCTION  5
Basic layouts of automotive vehicles including electric and hybrid electric systems, specifications and performance parameters of vehicles. Types of vehicle bodies & chasses.

UNIT II  ENGINE SYSTEMS  10

UNIT III  TRANSMISSION SYSTEM  10
Types of Clutch, gear box (manual and automatic), propeller shafting, differential and types of rear axle.

UNIT IV  AUTOMOTIVE SAFETY HANDLING AND COMFORT SYSTEMS  10
Braking System, Steering System, Suspension system, Electrical system, Safety systems, HVAC system.

UNIT V  TESTING AND SERVICING OF AUTOMOBILES  10
A brief discussion on the following:
Engine Tuning
Chassis Dynamometry
Tests for emissions of pollutants like HC, CO, NOx and particulates
Wind tunnel Testing of vehicles

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

ME2029  DESIGN OF JIGS, FIXTURES & PRESS TOOLS  L T P C
3 0 0 3

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

UNIT I  LOCATING AND CLAMPING PRINCIPLES:  8
Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements – principles of location – Locating methods and devices – Redundant Location – Principles of clamping – Mechanical actuation – pneumatic and hydraulic
actuation Standard parts – Drill bushes and Jig buttons – Tolerances and materials used.

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

**UNIT III  PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES**
10

**UNIT IV  BENDING FORMING AND DRAWING DIES**
10

**UNIT V  MISCELLANEOUS TOPICS**
7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke - Course should be supplemented with visits to industries.
(Use of Approved design Data Book permitted).

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

**REFERENCES:**
5. ASTME Fundamentals of Tool Design Prentice Hall of India.
AIM:
To appreciate the need for and applications of numerical techniques for solving problems in mechanical Engineering.

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

UNIT I INTRODUCTION
9

UNIT II ONE-DIMENSIONAL PROBLEMS
9

UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS
9

UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
9
Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V ISOPARAMETRIC FORMULATION AND MISCELLANEOUS TOPICS
9
Natural co-ordinate systems – Isoparametric elements – Shape functions for isoparametric elements – One and two dimensions – Serendipity elements – Numerical integration and application to plane stress problems - Matrix solution techniques – Solutions Techniques to Dynamic problems –

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM
With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES
- At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:
- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I     SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

UNIT II     INTERPOLATION AND APPROXIMATION
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT III     NUMERICAL DIFFERENTIATION AND INTEGRATION

UNIT IV     INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

UNIT V      BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods.
– One dimensional wave equation and two dimensional Laplace and Poisson equations.

\[ L = 45, \ T = 15, \ \text{TOTAL: 60 PERIODS} \]

TEXT BOOKS

REFERENCES

IE3008 MODELLING OF MANUFACTURING SYSTEMS

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OBJECTIVE:
To cover some of the modeling paradigms applicable for discrete items manufacturing systems and evaluation of such systems performance.

UNIT I FOCUSED FACTORIES
Manufacturing Systems and Models, Focused factory types, Group Technology – assigning machines to groups, assigning parts to machines, Mathematical program for group formation

UNIT II UNPACED PRODUCTION LINES
Production lines – Paced with and without buffers – computing system effectiveness; unpaced lines – impact of random processing times and recovery of throughput through buffers

UNIT III FMS PLANNING MODELS
FMS planning and Control Hierarchy – part selection and loading problems – knapsack and loading heuristic

UNIT IV MARKOV MODELS
Stochastic processes in manufacturing, Markov chain models – DTMC and CTMC, steady state analysis. Simulation models of manufacturing systems

UNIT V QUEUING AND PETRINET MODELS
Queuing networks in manufacturing – Jackson and Gordon Newell, product form solution, Petrinets in manufacturing – basic concepts, stochastic petrinets, system performance measure

TOTAL: 45 PERIODS

REFERENCES

MF3011 ROBOTICS LT P C
3 0 0 3

AIM:
To provide in-depth knowledge in various elements of Industrial Robotics

OBJECTIVE:
The objective of this course in to impart knowledge in the fundamentals of Industrial Robotics, viz. Robot Anatomy, Drives, Sensors, end effectors, Robot kinematics and programming

UNIT I FUNDAMENTALS OF ROBOT 8

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

UNIT III SENSORS AND MACHINE VISION 10
Requirements of a sensor, Principles and Applications of the following types of Sensors – Types of sensors – contact and non contact sensors.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 9
Homogeneous Transformation equation – DH representation - Forward kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of manipulators with Three Degrees of Freedom, Six Degrees of freedom – Deviations and problems.
Lead Through Programming, Robot Programming Languages – VAL programming – Motion Commands, Sensor Commands, End Effector commands and simple programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 9

TOTAL: 45 PERIODS

TEXT BOOK:
REFERENCES:

MF3015 ELECTRONICS MANUFACTURING TECHNOLOGY L T P C
3 0 0 3

AIM:
To import knowledge on electronics manufacturing and packaging technology.

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

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

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

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

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

UNIT V REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES

Repair tools, methods, rework criteria and process, thermo-mechanical effects and thermal management, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, reworkability, testing, reliability, and environment.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. Reflow Soldering Process and Trouble Shooting SMT,BGA,CSP and Flip Chip
7. www.ipc.org
8. www.smta.org

MF3404 FLEXIBLE MANUFACTURING SYSTEMS

AIM:
To impart knowledge on group technology, simulation, computer control, automatic manufacturing systems and factory of the future.

OBJECTIVE:
At the end of this course the student should be able to understand
- Modern manufacturing systems
- To understand the concepts and applications of flexible manufacturing systems
UNIT I  PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS  9

UNIT II  COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS  9
Introduction – Composition of FMS – Hierarchy of computer control – Computer control of work center and assembly lines – FMS supervising computer control - Types of software specification and selection – trends.

UNIT III  FMS SIMULATION AND DATA BASE  9

UNIT IV  GROUP TECHNOLOGY AND JUSTIFICATION OF FMS  9
Introduction - matrix formulation – Mathematical Programming formulation – Graph Formulation – Knowledge based system for group technology - Application of possibility distributions in FMS systems justification.

UNIT V  APPLICATIONS OF FMS AND FACTORY OF THE FUTURE  9

TOTAL:45 PERIODS

TEXT BOOK :

REFERENCES :
UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles-quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

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

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the basic principles of group dynamics and associated concepts required for Human resource management in organizations

UNIT I   INDIVIDUAL BEHAVIOR  9

UNIT II   GROUP BEHAVIOR  9
Group Organization, Group Dynamics, Emergence of Informal Leader, Leadership Styles-theories, Group decision making, Inter personal Relations, Communication - Team.

UNIT III   DYNAMICS OF ORGANIZATIONAL BEHAVIOR  9
Organizational Climate, the Satisfactory – Organizational change – the Change Process & Change Management.

UNIT IV   HUMAN RESOURCES PLANNING  9
Requirements of Human Resources – HR audit, Recruitment-Selection-Interviews

UNIT V   HUMAN RESOURCES DEVELOPMENT  9

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
UNIT III EVALUATION METHODS
Technology Choice and Evaluation - Methods of analysing alternate technologies, Techno-economic feasibility studies, Need for multi-criteria considerations such as, social, environmental, and political, Analytic hierarchy method, Fuzzy multi-criteria decision making, and other methods.

UNIT IV TECHNOLOGY TRANSFER
Technology Transfer and Acquisition - Import regulations, Implications of agreements like Uruguay Round and WTO, Bargaining process, Transfer option, MOU-Technology Adoption and Productivity - Adopting technology-human interactions, Organisational redesign and re-engineering, Technology productivity.

UNIT V TECHNOLOGY INNOVATION

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
5. Irvin M. Rubin, Organisational behavior an experimental approach, Prentice Hall, 1995

IE3017 SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:
• To cover the basics of supply chain concepts, associated networks, tools and techniques required for evaluating various supply chain processes.

UNIT I STRATEGIC FRAMEWORK
Objective, decision phases, process views, examples, strategic fit, supply chain drivers and metrics

UNIT II SUPPLY CHAIN NETWORKS
Distribution networks, Facility networks and design options, Factors influencing, Models for facility location and capacity allocation, Transportation networks and design options, Evaluating network design decisions

UNIT III MANAGING DEMAND AND SUPPLY IN A SUPPLY CHAIN
Predictable variability in a supply chain, Economies of scale and uncertainty in a supply chain – Cycle and safety Inventory, Optimum level of product availability, Forward Buying, Multi-echelon cycle inventory
UNIT IV SOURCING AND PRICING IN A SUPPLY CHAIN 10
Cross-Functional drivers, Role of sourcing in a supply chain, Logistics providers, Procurement process, Supplier selection, Design collaboration, Role of Pricing and Revenue Management in a supply chain

UNIT V INFORMATION TECHNOLOGY AND COORDINATION IN A SUPPLY CHAIN 10
The role of IT in supply chain, The supply chain IT framework, Customer Relationship Management, Supplier relationship management, Future of IT in supply chain, E-Business in supply chain, Bullwhip effect – Effect of lack of co-ordination in supply chain, Building strategic partnerships, CPFR

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

MG2021 MARKETING MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- To understand the various processes involved in Marketing and its Philosophy.
- To learn the Psychology of consumers.
- To formulate strategies for advertising, pricing and selling

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

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

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

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.
UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION
Characteristics, impact, goals, types, and sales promotions - point of purchase-unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME2035 ENTREPRENEURSHIP DEVELOPMENT

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

UNIT I ENTREPRENEURSHIP

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

UNIT III BUSINESS
UNIT IV   FINANCING AND ACCOUNTING

UNIT V   SUPPORT TO ENTREPRENEURS

TEXT BOOKS:

REFERENCES:

IE3001   PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING
OBJECTIVE:
• The purpose is to apprise the students on productivity improvement techniques for an organization and to create a system that response with flexibility of the changes through business process reengineering.

UNIT I   INTRODUCTION
Basic concept and meaning of Productivity – Significance of Productivity – Factors affecting Productivity – Productivity cycle, Scope of Productivity Engineering and Management.

UNIT II   PRODUCTIVITY MEASUREMENT AND EVALUATION

UNIT III   PRODUCTIVITY PLANNING AND IMPLEMENTATION
Need for Productivity Planning – Short term and long term productivity planning – Productivity improvement approaches, Principles - Productivity Improvement techniques – Technology based, Material based, Employee based, Product based techniques – Managerial aspects of Productivity Implementation schedule, Productivity audit and control.
UNIT IV REENGINEERING PROCESS
Definition, Fundamentals of process reengineering – Principles, Methodology and
guidelines for Organization Transformation, DSMCQ and PMP organization
Transformation models – Process Improvement Models like PMI, Edosomwan,
LMICIP and NPRDC Models.

UNIT V BPR TOOLS AND IMPLEMENTATION
Analytical and Process Tools and Techniques - Role of Information and
Communication Technology in BPR – Requirements and steps in BPR
Implementation – Case studies.

REFERENCES:
2. Edosomwan, J.A. Organizational Transformation and Process re- Engineering,
British Cataloging in publications, 1996.
3. Premvrat, Sardana, G.D. and Sahay, B.S. Productivity Management - A systems

IE3006 VALUE ENGINEERING AND PROJECT MANAGEMENT

OBJECTIVE:
To give a brief account of the value analysis and engineering tool for productivity
improvement through project management

UNIT I VALUE ENGINEERING BASICS
Origin of Value Engineering, Meaning of value, Definition of Value Engineering and
Value analysis, Difference between Value analysis and Value Engineering, Types of
Value, function - Basic and Secondary functions, concept of cost and worth, creativity In Value Engineering.

UNIT II VALUE ENGINEERING JOB PLAN AND PROCESS
Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural
and organizational aspects of Value Engineering, Ten principles of Value analysis,
Benefits of Value Engineering.

UNIT III PROJECT FORMULATION AND APPRAISAL
Project Management – An overview, Feasibility and Technical analysis, Marketing
feasibility, Financial and Economic feasibility, Formulation of Detailed Project
Reports (DPR).

UNIT IV PROJECT IMPLEMENTATION AND CONTROL
Project planning, Project organization, Tools and techniques of project management,
Project management Information system, Human resources, Financial aspects.

UNIT V PROJECT COMPLETION AND EVALUATION
Monitoring and Control of project, Integrated project management control system,
Managing transition from project to operations, project review.

TOTAL: 45 PERIODS
REFERENCES:

MF3001 PRODUCT DESIGN AND DEVELOPMENT

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

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

UNIT I INTRODUCTION

UNIT II CONCEPT GENERATION AND SELECTION

UNIT III PRODUCT ARCHITECTURE

UNIT IV INDUSTRIAL DESIGN
technology driven products – user – driven products – assessing the quality of industrial design.

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 15

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

WEB REFERENCE BOOK:
http://www.me.mit/.2.7444.

PT3024 PACKAGING MATERIALS & TECHNOLOGY L T P C 3 0 0 3
OBJECTIVE:
To study the fundamentals of packaging, manufacturing process, packaging materials and package testing.

UNIT I FUNDAMENTALS OF PACKAGING 6
Definition, functions of packaging, types and selection of package, Packaging hazards, interaction of package and contents, materials and machine interface, Environmental and recycling considerations - life cycle assessment
Package Design - Fundamentals, factors influencing design, stages in package development, graphic design, Structural design – simulation softwares

UNIT II PACKAGING MATERIALS 11
Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polysters, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Naphthalate (PEN), Nanomaterials, biodegradable materials – properties and applications, recycling; Wood, Paper, Textile, Glass, Metals - Tin, Steel, aluminum, Labelling materials, Cushioning Materials – properties and areas of application.

UNIT III CONVERSION TECHNOLOGY 12
Extrusion – Blown film, cast film, sheet, multilayer film & sheet, Lamination, Injection moulding, Blow moulding, Thermoforming; Cartoning Machinery, Bottling, Can former, Form Fill and Seal machines, Corrugated box manufacturing machineries,
Drums – types of drums, moulded pulp containers, Closures, Application of Robotics in packaging.
Surface treatment for printing, Printing processes – offset, flexo, gravure and pad printing

UNIT IV SPECIALITY PACKAGING
Aerosol packaging, Shrink and Stretch wrapping, Blister packaging, Anti-static packaging, Aseptic packaging, Active packaging, Modified Atmospheric Packaging, Ovenable package; Cosmetic packaging, Hardware packaging, Textile packaging, Food packaging; Child resistant and Health care packaging, Export packaging, Lidding, RFID in packaging.

UNIT V TESTING

TOTAL:45 PERIODS

TEXT BOOKS:

REFERENCES:

ME3021 ENERGY CONSERVATION AND MANAGEMENT

AIM:
To instruct the importance of energy conservation in both thermal and electrical energy and its management for the better utilization of resources.

OBJECTIVES:
At the end of the course, the student expected to do
(i) Understand and analyze the plant energy data
(ii) Energy audit and suggest methodologies for energy savings
(iii) Energy accounting and balance and
(iv) Able to utilize the available resources in optimal way
**PRE-REQUISITE:** Nil

**UNIT I**  
**IMPORTANCE OF ENERGY CONSERVATION AND MANAGEMENT**  
8  

**UNIT II**  
**ELECTRICAL SYSTEMS**  
12  

**UNIT III**  
**THERMAL SYSTEMS**  
10  

**UNIT IV**  
**ENERGY CONSERVATION**  
8  
Energy conservation in Pumps, Fans (flow control) and blowers, Compressed Air Systems, Refrigeration and air conditioning systems – Waste heat recovery recuperators, heat sheets, heat pipes, heat pumps.

**UNIT V**  
**ENERGY MANAGEMENT, ECONOMICS**  
7  

**TOTAL:** 45 PERIODS

**TEXT BOOKS:**


**REFERENCES:**

IE3002 SAFETY ENGINEERING AND MANAGEMENT L T P C 3 0 0 3

OBJECTIVE:
To impart knowledge on safety engineering fundamentals and safety management practices

UNIT I INTRODUCTION 9
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS 9
Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL 9
Industrial Health Hazards – Environmental Control – Industrial Noise- Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV ENVIRONMENTAL CONTROL 9
System Safety Analysis – Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT V SAFETY REGULATIONS 9

TOTAL: 45 PERIODS

REFERENCES

IE3013 MAINTENANCE ENGINEERING AND MANAGEMENT L T P C 3 0 0 3

OBJECTIVE:
• To cover maintenance strategies, associated models for application and evaluation in different types of industries

UNIT I MAINTENANCE CONCEPT 8

UNIT II MAINTENANCE MODELS 10
Probability models in maintenance – Choice between PM and b/d maintenance – Optimal PM schedule and quality loss – Inspection decisions: Maximization of profit –

UNIT III MAINTENANCE LOGISTICS

UNIT IV REPLACEMENT MODELS
Component replacement decisions – Assumptions – Model for equipment whose operating cost increases with use – Preventive replacement age of item subject to breakdown – Preventive replacement interval/age: minimization of downtime, Capital equipment replacement decisions

UNIT V ADVANCED MAINTENANCE

TOTAL: 45 PERIODS

REFERENCES:

GE2025 PROFESSIONAL ETHICS IN ENGINEERING

UNIT I ENGINEERING ETHICS

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER’S RESPONSIBILITY FOR SAFETY
UNIT IV  RESPONSIBILITIES AND RIGHTS  

UNIT V  GLOBAL ISSUES  

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES: