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**TOTAL : 28 CREDITS**

| 10. | - | English Language Laboratory | 0 | 0 | 2 | - |

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

+ Offering English Language Laboratory as an additional subject (with no marks) during 2\(^{nd}\) 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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HS2161 TECHNICAL ENGLISH II L T P C

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 12
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 12

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
12
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. Brain storming 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

UNIT I
ORDINARY DIFFERENTIAL EQUATIONS 12
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II
VECTOR CALCULUS 12

UNIT III
ANALYTIC FUNCTIONS 12
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.

UNIT IV
COMPLEX INTEGRATION 12

UNIT V
LAPLACE TRANSFORM 12

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.
TEXT BOOKS

REFERENCES

PH2161 ENGINEERING PHYSICS – II

UNIT I CONDUCTING MATERIALS

UNIT II SEMICONDUCTING MATERIALS

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS
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
UNIT V  MODERN ENGINEERING MATERIALS  
Metallic glasses: preparation, properties and applications.  
Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application,  
advantages and disadvantages of SMA  
Nanomaterials: synthesis – plasma arcing – chemical vapour deposition – sol-gels –  
electrodeposition – ball milling - properties of nanoparticles and applications.  
Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour  
deposition - structure – properties and applications.  

TOTAL: 45 PERIODS  

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

REFERENCES  
3. Palanisamy P.K, ‘Materials science’, Scitech publications(India) Pvt. LTD., Chennai,  

CY2161  ENGINEERING CHEMISTRY – II  
LTPC 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  
Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf –  
Single electrode potential – Nernst 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

UNIT IV  PHASE RULE AND ALLOYS  9

UNIT V  ANALYTICAL TECHNIQUES  9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I    BASICS & STATICS OF PARTICLES  12

UNIT II    EQUILIBRIUM OF RIGID BODIES  12

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

EE2151 CIRCUIT THEORY
(Common to EEE, EIE and ICE Branches) 3 1 0 4

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
EC2151 ELECTRIC CIRCUITS AND ELECTRON DEVICES L T P C
(For ECE, CSE, IT and Biomedical Engg. Branches) 3 1 0 4

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
(Common to branches under Civil, Mechanical and Technology faculty)

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

REFERENCES
(2005).
GE2152 BASIC CIVIL & MECHANICAL ENGINEERING
(Common to branches under Electrical and I & C Faculty)
L T P C 4 0 0 4

A – CIVIL ENGINEERING

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

B – MECHANICAL ENGINEERING

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:

GE2155 COMPUTER PRACTICE LABORATORY – II

LIST OF EXPERIMENTS

1. UNIX COMMANDS

   Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING

   Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX

   Dynamic Storage Allocation-Pointers-Functions-File Handling

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 BaCl$_2$ vs Na$_2$SO$_4$
4. Potentiometric Titration (Fe$^{2+}$/KMnO$_4$ or K$_2$Cr$_2$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 Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

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

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

EE2155 ELECTRICAL CIRCUIT LABORATORY (Common to EEE, EIE and ICE)

LIST OF EXPERIMENTS

1. Verification of ohm’s laws and kirchoff’s laws.
2. Verification of Thевemin’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
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

ENGLISH LANGUAGE LABORATORY (Optional)  L T P C
0 0 2 -

1. Listening: 5
Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. Speaking: 5
Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session 20
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:
21

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.

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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

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:

MA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATION L T P C
(Common to all branches) 3 1 0 4

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
Formation of partial differential equations – Lagrange’s linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

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
TEXT BOOKS

REFERENCES

ME2201 MANUFACTURING TECHNOLOGY – I

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

Sheet metal characteristics - Typical shearing operations, bending and drawing operations — Stretch forming operations — Formability of sheet metal — Test methods — Working principle and application of special forming processes — Hydro forming — Rubber pad forming — Metal spinning — Introduction to Explosive forming, Magnetic pulse forming, Peen forming, Super plastic forming.

UNIT V MANUFACTURING OF PLASTIC COMPONENTS

Types of plastics - Characteristics of the forming and shaping processes — Moulding of Thermoplastics — Working principles and typical applications of - Injection moulding — Plunger and screw machines — Compression moulding, Transfer moulding - Typical industrial applications — Introduction to Blow moulding — Rotational moulding — Film blowing — Extrusion - Thermoforming, - Bonding of Thermoplastics.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
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

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

TEXT BOOKS


REFERENCES

STANDARDS

CE3204 STRENGTH OF MATERIALS L T P C 3 0 0 3
UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 8

UNIT II TRANSEVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 13

UNIT III TORSION 6
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 10
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 9
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
UNIT I LINEAR PROGRAMMING
Introduction - formulation of linear programming model - Graphical solution – solving LPP using simplex algorithm – Revised Simplex Method

UNIT II ADVANCES IN LPP –I
Duality theory - Dual simplex method - Sensitivity analysis — Transportation problems – Assignment problems- Traveling sales man problem -Data Envelopment Analysis

UNIT III ADVANCES IN LPP –II
Integer programming – Multi objective optimization - Goal programming

UNIT IV NETWORK MODELS

UNIT V DYNAMIC PROGRAMMING
Elements of dynamic programming – state –stage-recursive equations – computational procedure – applications

TOTAL :45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE
To gain hands on experience on working of general purpose machine tools and on various manufacturing processes.

UNIT I    LATHE
1.1. Facing, plain turning and step turning
1.2. Taper turning using compound rest, Tailstock set over, etc
1.3. Single and Multi-start V thread, cutting and knurling
1.4. Boring and internal thread cutting.

UNIT II    WELDING EXERCISES
2.1. Horizontal, Vertical and Overhead welding.
2.2. Gas Cutting, Gas Welding
2.3. Brazing - for demonstration purpose

UNIT III    SHEET METAL WORK
3.1. Fabrication of sheet metal tray
3.2. Fabrication of a funnel

UNIT IV    PREPARATION OF SAND MOULD
4.1. Mould with solid, split patterns
4.2. Mould with loose-piece pattern
4.3. Mould with Core

UNIT V    PLASTIC MOULDING
5.1 Injection Moulding- for demonstration purpose

TOTAL: 45 PERIODS

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<td>Standard tools and calipers for sheet metal work</td>
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IM3203 WORK SYSTEM DESIGN LAB

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

CE3207 STRENGTH OF MATERIALS LABORATORY

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

LIST OF EXPERIMENTS
1. Tension test on mild steel rod.
2. Double shear test on metals.
3. Torsion test on mild steel rod.
4. Impact test on metal specimen.
5. Hardness test on metals.
6. Compression test on helical spring
7. Deflection test on carriage spring.

TOTAL : 45 PERIODS

MA3211 PROBABILITY AND STATISTICS

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

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  
Discrete and Continuous random variables – Moments – Moment generating functions – 
Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal 
distributions - Functions of a random variable.

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

UNIT III  TESTING OF HYPOTHESIS  
Sampling distributions - Tests for single mean, proportion, Difference of means (large and 
small samples) – Tests for single variance and equality of variances – χ²-test for 
goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness 
and Rank-sum test (Wilcoxon test).

UNIT IV  DESIGN OF EXPERIMENTS  
Completely randomized design – Randomized block design – Latin square design - 2² 
factorial design.

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

T : 45 + 15 , TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., “Probability and Statistics for 
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:
OBJECTIVE:

- 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  12
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  12
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  12
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  12
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  12
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.

TUTORIAL = 15 L = 45 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

UNIT II CENTRE LATHE AND SPECIAL PURPOSE LATHES
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 – automat – single spindle, Swiss type, automatic screw type, multi spindle - Turret Indexing mechanism, Bar feed mechanism.

UNIT III OTHER MACHINE TOOLS

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


TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT II  FIRST AND SECOND LAW OF THERMODYNAMICS  12

UNIT III HEAT ENGINES  12

UNIT IV GASES AND VAPOUR MIXTURES  12

UNIT V HEAT TRANSFER  12

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  6  

UNIT II     PRODUCTION ANALYSIS AND PRICING  9  
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  10  
Estimation of Material, Labor and Overhead Cost, Allocation of Overheads. Estimation for different types of jobs.

UNIT IV     COSTING  10  
Job Costing-Operating Costing-Process Costing- Standard Costing (Variance Analysis)

UNIT V      ACCOUNTING  10  
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 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
Calibration of Flow Measuring instruments – venturimeter, orificemeter, rotometer,
Calibration of flows in open channels – weirs and notches. Estimation of friction factor in
flow through pipes.

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

ME2258  MANUFACTURING TECHNOLOGY LAB II  L T P C 0 0 3 2

OBJECTIVE
To give a practical hands on exposure to students in the various metal cutting operations
using commonly used machine tools

EXERCISES
1. Two or More Measurements in Metal Cutting Experiment (Example: Shear Angle,
Cutting Force, Tool Wear etc.)
2. One or More Exercises in Shaper, Slotter, Planner, Drilling, Milling Machines
   (Example: Round to Square, Dovetail in shaper, Internal keyway cutting in Slotter,
   Round to square in Planner, Drilling, reaming and tapping in Drilling machine, Gear
   Milling and Keyway milling in Milling machine.)
3. Two or More Exercises in Grinding / Abrasive machining
   (Example: Surface Grinding, Cylindrical Grinding.)
4. Two or More Exercises in Assembly of Machined Components for different fits.
   (Example: Parts machined using Lathes, Shapers, Drilling, Milling, and Grinding
   Machines etc.)
5. One or More Exercises in Capstan or Turret Lathes
6. One or More Exercises in Gear Machining
   (Example: Gear Milling, Gear Hobbing etc.)
LIST OF EQUIPMENT
(For a batch of 30 students)

1. Centre Lathes - 2 Nos.
2. Turret and Capstan Lathes - 1 No.
3. Horizontal Milling Machine - 1 No.
5. Surface Grinding Machine - 1 No.
7. Shaper - 2 Nos.
8. Slotter - 1 No.
9. Planner - 1 No.
11. Tool Dynamometer - 1 No.
13. Tool Makers Microscope - 1 No.

TOTAL: 45 PERIODS

IM3301 MANAGEMENT AND ENTREPRENEURSHIP LT P C 3 0 0 3
UNIT I MANAGEMENT 9

UNIT II PLANNING 9

UNIT III ORGANIZING AND STAFFING 9

UNIT IV DIRECTING & CONTROLLING 9
UNIT V ENTREPRENEUR
Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
& Co.

IE3302 OPERATIONS RESEARCH – II

OBJECTIVE
To impart knowledge on some probabilistic optimization techniques

UNIT I DETERMINISTIC INVENTORY MODELS 12
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 12
Probabilistic inventory model – Reorder point model – multi product-Selective
Inventory control.

UNIT III QUEUING THEORY 12
Queueing theory terminology – Single server, multi server, Limited queue capacity –
applications – Markov chains

UNIT IV DECISION THEORY 12
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 12
Replacement models – Money value, present worth factor and discount rate.

TOTAL: 60 PERIODS
TEXT BOOK

REFERENCES

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


Text book:

References:

IM3304 INDUSTRIAL ENGINEERING

UNIT I  PRODUCTIVITY  7
Definition of productivity, individual enterprises, task of management. Productivity of materials, land, building, machine and power. Measurement of productivity, factors affecting the productivity, productivity improvement programmes, wages and incentives (simple numerical problems).

UNIT II  WORK STUDY  13
Definition, objective and scope of work study. Human factor in work study. Work study and management, work study and supervision, work study and worker.

INTRODUCTION TO METHOD STUDY: Definition, objective and scope of method study, activity recording and exam aids. Charts to record moments in shop operation – process charts, flow process charts, travel chart and multiple activity charts. (With simple problems)

UNIT III  MICRO AND MEMO MOTION STUDY  8
Charts to record moment at work place – principles of motion economy, classification of moments two handed process chart, SIMO chart and micro motion study. Development, definition and installation of the improved method, brief concept about synthetic motion studies.

UNIT IV  INTRODUCTION TO WORK MEASUREMENT  8
Definition, objective and benefit of work measurement. Work measurement techniques. Work sampling: need, confidence levels, sample size determinations, random observation, conducting study with the simple problems.
UNIT V TIME STUDY
Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors of affecting rate of working, allowances and standard time determination. Predetermined motion time study – Method time measurement (MTM)

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. Industrial Engineering Hand book Maynard –

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

UNIT IV AUTOMATED HANDLING AND STORAGE 9

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

IM3307 AUTOMATION LABORATORY LT P C
0 0 3 2
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

IM3308 INDUSTRIAL ENGINEERING LAB L T P C
0 0 2 1

METHOD STUDY
1. Recording Techniques: Preparing the following charts and diagrams (Minimum 3 Charts)
   Outline process chart
   Multiple Activity Chart
   Flow process chart and Flow diagram
   String diagram,
2. Experiments on the Application of principle of motion economy Two handed process chart
3. Exercises on conducting method study for assembling simple components and office work.
4. Development of Layout plans using SLP technique
5. Experiments on Line balancing.

WORK MEASUREMENT
6. Rating practice using walking simulator
7. Rating practice using pin board assembly
8. Rating practice for dealing a deck of cards
9. Rating practice for marble collection activity
10. Determining the standard time for simple operations using stopwatch time study
11. Exercises on estimating standard time using PMTS.
12. Determination of standard time using PDA device and time study software
13. Experiments on office work measurement through work sampling
14. Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
15. Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer Effect of Noise, Light, Heat on human efficiency in work environments.

REFERENCES:
1. Work Study - Ralph & Barnes
2. Introduction to Work Study - ILO

IM3309 TECHNICAL SEMINAR LT PC 0 0 2 1

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

IE3351 MULTI VARIATE STATISTICAL ANALYSIS LT PC 3 0 0 3

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
Cluster analysis – clustering methods, Multivariate analysis of variance

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCE:

IE3352 PRINCIPLES OF COMPUTER INTEGRATED MANUFACTURING SYSTEMS L T P C 3 0 0 3

OBJECTIVE:
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
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

TOTAL : 45 PERIODS

REFERENCES:
UNIT I BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS

UNIT II DESIGNING THE SUPPLY CHAIN NETWORK

FACILITY LOCATION AND NETWORK DESIGN

UNIT III PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN

UNIT IV SOURCING, TRANSPORTATION AND PRICING PRODUCTS
Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

SOURCING, TRANSPORTATION AND PRICING PRODUCTS

UNIT V COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN
Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships.

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN

EMERGING CONCEPTS
Reverse Logistics; Reasons, Activities, Role. RFID Systems; Components, applications, implementation. Lean supply chains, Implementation of Six Sigma in Supply Chains.

TOTAL : 45 PERIODS
TEXT BOOK:

REFERENCE BOOKS:

IM3315 OPERATIONS MANAGEMENT LT P C
3 0 0 3

UNIT I

UNIT II OPERATIONS DECISION MAKING 10
Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision support systems, Economic models, Statistical models.

SYSTEM DESIGN AND CAPACITY
Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

UNIT III FORECASTING DEMAND 10
Forecasting objectives and uses, Forecasting variables, Opinion and Judgemental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction- planning and scheduling, Objectives of aggregate planning, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

UNIT IV MATERIAL AND CAPACITY REQUIREMENTS PLANNING 6
Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

UNIT V SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES 13
Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guidelines, Scheduling methodology, priority control, capacity control.
SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs.

FLOW–SHOP SCHEDULING: Introduction, Johnson’s rule for ‘n’ jobs on 2 and 3 machines, CDS heuristic.

JOB-SHOP SCHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on ‘m’ machines.

TOTAL : 45 PERIODS

TEXT BOOKS:
3. Productions & operations management - Adam & Ebert.5th edition PHI

REFERENCE S:
4. Operations Management - Lee J Karjewski and Larry P Ritzman,— strategy and Analysis, 6th Edn, Pearson Education Asia

IM3316 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:
  1. Forecasting and Aggregate Planning
  2. Materials Requirement Planning and Capacity Planning
  3. Transportation and Distribution of goods
  4. Group technology and Cellular manufacturing
  5. Production and Project Scheduling
  6. Quality Control
  7. Plant Layout Design
  8. Methods improvement in manufacturing and service organization

TOTAL: 90 PERIODS
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

UNIT- V  Optimization Package (TORA /LINDO)
5. LP Models
6. Transportation
7. Assignment
8. Maximal flow
9. Minimal spanning tree
10. Shortest route
11. Network scheduling

TOTAL: 45 PERIODS
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.

<table>
<thead>
<tr>
<th>I. PC based session (Weightage 40%)</th>
<th>24 periods</th>
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</thead>
</table>

A. ENGLISH LANGUAGE LAB (18 Periods)

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

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

3. SPEAKING:

   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
   Structuring the resume / report - Letter writing / Email Communication - Samples.

2. RESENTATION SKILLS:
   Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

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

4. GROUP DISCUSSION:
   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:
   Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

II. Practice Session (Weightage – 60%) 24 periods

1. Resume / Report Preparation / Letter writing: Students prepare their own resume and report. (2)

2. Presentation Skills: Students make presentations on given topics. (8)

3. Group Discussion: Students participate in group discussions. (6)

4. Interview Skills: Students participate in Mock Interviews (8)

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>
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<tbody>
<tr>
<td>1.</td>
<td><strong>Server</strong></td>
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<tr>
<td></td>
<td>o PIV system</td>
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<tr>
<td></td>
<td>o 1 GB RAM / 40 GB HDD</td>
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<tr>
<td></td>
<td>o OS: Win 2000 server</td>
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<tr>
<td></td>
<td>o Audio card with headphones (with mike)</td>
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<td>o JRE 1.3</td>
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<td>2.</td>
<td><strong>Client Systems</strong></td>
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<td>o PIII or above</td>
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<td>o 256 or 512 MB RAM / 40 GB HDD</td>
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<td>3.</td>
<td><strong>Handicam Video Camera (with video lights and mic input)</strong></td>
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<td>4.</td>
<td><strong>Television - 29”</strong></td>
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<td>5.</td>
<td><strong>Collar mike</strong></td>
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<td>6.</td>
<td><strong>Cordless mikes</strong></td>
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<td>7.</td>
<td><strong>Audio Mixer</strong></td>
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<tr>
<td>8.</td>
<td><strong>DVD Recorder / Player</strong></td>
<td>1 No.</td>
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</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  5
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  10
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  10
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, Yate’s algorithm, practical applications.

UNIT IV  SPECIAL EXPERIMENTAL DESIGNS  10
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  10
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. Douglas C.Montgomery, Design and Analysis of Experiments, John Wiley & Sons,2005

REFERENCES :
UNIT I INTRODUCTION


UNIT II TQM PRINCIPLES

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and 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


UNIT IV TQM TOOLS & TECHNIQUES II


UNIT V QUALITY SYSTEMS


TOTAL: 45 PERIODS

TEXT BOOK:

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

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

UNIT II RANDOM NUMBERS/ VARIATES
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
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
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

TOTAL : 45 PERIODS

REFERENCES
   http://www.bcnn.net
UNIT I  FUNDAMENTALS OF INFORMATION SYSTEMS  12
Information systems in business, fundamentals of information systems solving business problems with information systems.
Business Information systems, Transaction processing systems, management information systems and decision support systems. Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.

UNIT II  ISSUES IN MANAGING INFORMATION TECHNOLOGY  12
Managing information resources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology.

UNIT III  INTRODUCTION TO E-BUSINESS  8
E-commerce frame work, Media convergence, Consumer applications, Organization applications.


UNIT IV  CONSUMER-ORIENTED E-COMMERCE  7

UNIT V  ELECTRONICS DATA INTERCHANGE (EDI)  6
EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
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/Package

TOTAL: 45 PERIODS

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

UNIT I  INTRODUCTION

UNIT II  ANATOMY, POSTURE AND BODY MECHANICS
Muscle Functionin, Spine, Musculoskeletal problems in Sitting and Standing.

UNIT III  ANTHROPOMETRIC PRINCIPLES
Anthropometric Data – sample, equipment, analysis. Applications of Anthropometry in Design. Workstation design for standing and seated posture.
UNIT IV 
**UPPER BODY AT WORK**

Injuries due to upper body at work, Neck problems, shoulder, elbow and wrist, Design of manual handling tasks.

UNIT V 
**PHYSIOLOGY, WORKLOAD AND WORK CAPACITY**


**REFERENCES:**

1. ILO, “Introduction to Work study”.
3. R. S. Bridger, “Introduction to Ergonomics”, Taylor and Francis

**IM3412 PROJECT WORK**

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.
IM3005 ADVANCED OPTIMIZATION TECHNIQUES  LT  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  9
Data Envelopment Analysis, Multicriteria Decision Problems - Goal Programming,
Analytic Hierarchy Process

UNIT II NON-LINEAR MODELS -I  9
Types of Non-linear programming problems, unconstrained optimization, Linearly
Constrained Optimization, Quadratic Programming, Convex Programming,

UNIT III NON-LINEAR MODELS -II  9
KKT conditions for constrained optimization, Separable programming, Non-convex
programming, Geometric programming

UNIT IV MARKOV PROCESSES  9
Markov Processes, Neural network based optimization

UNIT V METAHEURISTICS  9

REFERENCES:
Quantitative approaches to Decision Making, Thomson, 2003

TOTAL: 45 PERIODS

IE3009 COMPUTATIONAL METHODS & ALGORITHMS  LT  P  C
3 0 0 3

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
Greedy – divide and conquer – backtracking – branch & bound – heuristics- Meta
heuristics

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

IE3010  DECISION SUPPORT AND INTELLIGENT SYSTEMS  L T P C
3 0 0 3

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
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:

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

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 fixtureing systems- Quick change fixtures.

UNIT III  PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES  10
Selection of Standard parts – Design and preparation of four standard views of simple blanking, piercing, compound and progressive dies.

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.

ME2353  FINITE ELEMENT ANALYSIS  L T P C
3 1 0 4

INTRODUCTION (Not for examination)  5

UNIT I  FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS  5+3
UNIT II ONE DIMENSIONAL FINITE ELEMENT ANALYSIS 8+4

UNIT III TWO DIMENSIONAL FINITE ELEMENT ANALYSIS 10+4

UNIT IV DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD 8+4

UNIT V APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS 6+3
One dimensional heat transfer element – application to one-dimensional heat transfer problems – scalar variable problems in 2-Dimensions – Applications to heat transfer in 2-Dimension – Application to problems in fluid mechanics in 2-D

TEXT BOOK:

REFERENCE BOOKS:

Note: L- no. of lectures/week, T- no. of tutorials per week
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,   TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

IE3008  MODELLING OF MANUFACTURING SYSTEMS  L T P C  3 0 0 3

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

UNIT I  FOCUSED FACTORIES  9
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  9
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  9
FMS planning and Control Hierarchy – part selection and loading problems – knapsack and loading heuristic

UNIT IV  MARKOV MODELS  9
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

ME2028 ROBOTICS

OBJECTIVES:
- To understand the basic concepts associated with the design and functioning and applications of Robots
- To study about the drives and sensors used in Robots
- To learn about analyzing robot kinematics and robot programming

UNIT I FUNDAMENTALS OF ROBOT

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS

UNIT III SENSORS AND MACHINE VISION
UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  10
Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and
Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2
Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems.
Teach Pendant Programming, Lead through programming, Robot programming
Languages – VAL Programming – Motion Commands, Sensor Commands, End effector
commands, and Simple programs

UNIT V  IMPLEMENTATION AND ROBOT ECONOMICS  8
RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety
Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method,
EUAC Method, Rate of Return Method.

TOTAL: 45 PERIODS

TEXT BOOK:
McGraw-Hill, 2001

REFERENCES:
1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., “Robotics Control, Sensing, Vision and
Intelligence”, McGraw-Hill Book Co., 1987

IM3015  WORLD CLASS MANUFACTURING  L T P C
3 0 0 3

UNIT I  INDUSTRIAL DECLINE AND ASCENDANCY  9
Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade -
American decade - Global decade

UNIT II  BUILDING STRENGTH THROUGH CUSTOMER – FOCUSED
PRINCIPLES  9
Customer - Focused principles - General principles - Design - Operations - Human resources -
Quality and Process improvement - Promotion and Marketing

UNIT III  VALUE AND VALUATION  9
Product Costing - Motivation to improve - Value of the enterprises

QUALITY
The Organization : Bulwark of stability and effectiveness - Employee stability – Quality
Individuals Vs. Teams - Team stability and cohesiveness - Project cohesiveness and stability

UNIT IV  STRATEGIC LINKAGES  9
Product decisions and customer service - Multi-company planning - Internal manufacturing
planning - Soothing the demand turbulence

69
UNIT V  IMPEDIMENTS  
Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines – Whole Plant Associates - Facilitators - Teamsmanship - Motivation and reward in the age of continuous Improvement

TEXT BOOKS

MF3404  FLEXIBLE MANUFACTURING SYSTEMS  LT P C  3 0 0 3

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

OBJECTIVES:
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

UNIT III  FMS SIMULATION AND DATA BASE  9

UNIT IV  GROUP TECHNOLOGY AND JUSTIFICATION OF FMS  9
UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE


TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES

IE3003 HUMAN RESOURCES MANAGEMENT

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

UNIT I INDIVIDUAL BEHAVIOR
Personality – Types – Influencing Personality – Learning Process, Attribute Perception – Motivation Theories

UNIT II GROUP BEHAVIOR
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
Organizational Climate, the Satisfactory – Organizational change – the Change Process & Change Management.

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

UNIT V HUMAN RESOURCES DEVELOPMENT

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:

IE3007 TECHNOLOGY MANAGEMENT L T P C
UNIT I INTRODUCTION 9
Technology management - Scope, components, and overview. Technology and environment, Technology and society, Technology Impact analysis, environmental, social, legal, political aspects, techniques for analysis - steps involved. Technology policy strategy: Science and technology Policy of India, implications to industry.

UNIT II TECHNOLOGY FORECASTING MODELS 9

UNIT III EVALUATION METHODS 9
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 9
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 9

TOTAL: 45 PERIODS

TEXT BOOK

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

<table>
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<td>IM3014</td>
<td>INDUSTRIAL LAWS</td>
<td>3 0 0 3</td>
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**UNIT I**

*THE INDUSTRIAL DISPUTES ACT, 1947*


**UNIT II**

*THE TRADE UNION ACT 1926*

Formation of Trade Unions, Collective bargaining capacity.

**UNIT III**

*THE FACTORIES ACT, 1948*


**UNIT IV**

*THE SALE OF GOODS ACT, 1930 (3 OF 1930)*


**UNIT V**

*THE MONOPOLIES AND RESTRICTIVE TRADE PRACTICES ACT, 1969 (54 OF 1969) & THE COMPETITION ACT, 2002*

Monopolies and Restrictive Trade Practices Commission, Unfair and Restrictive trade practices. The Competition Commission,

**TEXT BOOKS:**

3. Taxman, Commercial Laws.

**REFERENCE:**

1. Bare Acts and Bare Acts with Cases for each of these.
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  9
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:
7. Graeme Drummond and John Ensor, Introduction to marketing concepts, Elsevier, Indian Reprint, 200
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  9

UNIT II  MOTIVATION  9
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  9

UNIT IV  FINANCING AND ACCOUNTING  9

UNIT V  SUPPORT TO ENTREPRENEURS  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
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
Productivity measurement in International, National and Industrial level – Total
Productivity Model – Productivity measurement in Manufacturing and Servicesectors –
Performance Objective Productivity (PO) model – Need for Productivity Evaluation –
Evaluation Methodology.

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.

TOTAL : 45 PERIODS

REFERENCES:
1. Sumanth, D.J.Productivity Engineering and Management, TMH, New Delhi,
1990
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
UNIT I INTRODUCTION TO SERVICE SECTOR
Various Services: i) Hotel ii) Health Care iii) Bank iv) Retail Marketing / Department Stores

UNIT II RESOURCES USED IN SERVICE SECTOR

CRITICAL ASPECTS OF SERVICE SECTOR:
i) Customer Satisfaction ii) Cost reduction iii) Efficiency iv) Quality &Productivity of Service organisations, Measurement of these characteristics.

UNIT III APPLICATION OF INDUSTRIAL ENGINEERING TECHNIQUES TO THE SERVICE SECTOR
i) Data collection – Various charting techniques, Flow Diagram, work measurement – time study, activity sampling, self recording, etc. ii) Quantitative techniques. iii) Data analysis – Critical Examination / evaluation of data. iv) Work of simplification, form design. v) Computer application to collection, storage and retrieval of information / data.

UNIT IV USE OF COMPUTERS IN SERVICE ORGANIZATIONS
Plant, local area network, wide area network to Collect, store, retrieve, transmit information / data.

UNIT I FUTURE OF SERVICE SECTOR

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. Fitzsimmons; Service Management; Mc Graw Hill Publications.
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

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:
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

UNIT V
DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

TOTAL : 45 PERIODS

TEXT BOOK
REFERENCES

WEB REFERENCE BOOK

PT3024 PACKAGING MATERIALS & TECHNOLOGY LT P C
3 0 0 3

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

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

UNIT II PACKAGING MATERIALS
Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polyesters, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Napthalate (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

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
REFERENCES
   Gunilla Johnson, “Corrugated Board Packaging”, PIRA International

ME3021 ENERGY CONSERVATION AND MANAGEMENT  LT P C
3 0 0 3

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

OBJECTIVE:
At the end of the course, the student expected to do
- Understand and analyze the plant energy data
- Energy audit and suggest methodologies for energy savings
- Energy accounting and balance and
- Able to utilize the available resources in optimal way

PRE-REQUISITE : NIL

UNIT I IMPORTANCE OF ENERGY CONSERVATION AND
MANAGEMENT  8
World, national Energy consumption – environmental aspects – Energy prices,
policies – Energy auditing : methodology, analysis, energy accounting –
Measurements – Thermal and Electrical.

UNIT II ELECTRICAL SYSTEMS  12
AC / DC current systems, Demand control, power factor correction, load
management, Motor drives : motor efficiency testing, energy efficient motors, motor
speed control – Lighting : lighting levels, efficient options, daylighting, timers, Energy
efficient windows – electrical distribution systems – Transformers – Power quality –
harmonic distortion.
UNIT III THERMAL SYSTEMS

UNIT IV ENERGY CONSERVATION
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

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

IM3002 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
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

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

UNIT III ENVIRONMENTAL CONTROL
Industrial Health Hazards – Environmental Control –Industrial Noise-Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.
UNIT IV ENVIRONMENTAL CONTROL
System Safety Analysis – Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT V SAFETY REGULATIONS
Explosions – Disaster management – catastrophe control, hazard control
Factories Act, Safety regulations Product safety – case studies.

TOTAL: 45 PERIODS

REFERENCES

IE3013 MAINTENANCE ENGINEERING AND MANAGEMENT LT 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

UNIT II MAINTENANCE MODELS

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: