CM131 Chemistry I	**2**	**1**	**2**	**4**

1. CHEMICAL THERMODYNAMICS **9**

Definition of free energy and spontaneity - Maxwell relations - Gibbs-Helmholtz equation - Van't hoff equations - Stoichiometry and energy balances in Chemical reactions.

2. DYNAMICS OF CHEMICAL PROCESSES **10**

Basic concepts - composite reactions (opposing, parallel and consecutive reactions) - Collision theory - Thermodynamic formulation of reaction rates - unimolecular reactions - Chain reactions (Stationary and non-stationary) - Enzyme Kinetics - Michaelis - Menten Equation.

3. ELECTRODICS **8**

Types of electrodes and cells - Nernst Equation - emf measurement and its applications - Principles of chemical and electrochemical corrosion - corrosion control (Sacrificial anode and impressed current methods).

4. WATER **8**

Water quality parameters - Definition and expression - Estimation of hardness (EDTA method) - Alkalinity (Titrimetry) - Water softening (zeolite) - Demineralisation (Ion- exchangers) and desalination (RO) - Domestic water treatment.

5. POLYMERS **10**

Monomer - Functionality - Degree of polymerisation - Classification based on source and applications - Addition, Condensation and copolymerisation - Mechanism of free -radical polymerisation - Thermoplastics and thermosetting plastics - Processing of plastics - Injection moulding, blow moulding and extrusion processes.

6. PRACTICALS **30**

I. Water Analysis : Determination of hardness, alkalinity , DO, Fe(spectrophotometry) and Na and K (Flame photometry).
II. Electrochemistry and corrosion experiments.
III. Polymer experiments.

Total No of periods: 75

CM131 Chemistry I	**2**	**1**	**2**	**4**

Text Books:

1. *Alkins P.W., " Physical Chemistry ", ELBS, IV Edition, 1998, London.*

References:

1. *Balasubramanian M.R., Krishnamoorthy S. and Murugesan V., " Engineering Chemistry ", Allied Publisher Limited., Chennai, 1993.*
2. *Karunanidhi M., Ayyaswamy N., Ramachandran T and Venkatraman H., " Applied Chemistry ", Anuradha Agencies, Kumbakonam , 1994.*
3. *Sadasivam V., " Modern Engineering Chemistry - A Simplified Approach ", Kamakya Publications, Chennai , 1999.*
4. *Kuriakose, J.C. and Rajaram J., " Chemistry in Engineering and Technology ", Vol. I and II, Tata McGraw-Hill Publications Co.Ltd, New Delhi ,1996.*
5. *Jain P.C. and Monica J., " Engineering Chemistry ", Dhanpat Rai Publications Co.,(P) Ltd., New Delhi, 1998.*

GE131 Engineering Mechanics **3 1 0 4**

1. BASICS **5**

Introduction - Units and Dimensions - Laws of Mechanics - Vectors - Vectorial representation of forces and moments - Vector operations.

2. STATICS OF PARTICLES **8**

Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - single equivalent force.

3. EQUILIBRIUM OF RIGID BODIES **7**

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Equilibrium of Rigid bodies in two dimensions - Equilibrium of rigid bodies in three dimensions.

4. PROPERTIES OF SURFACES AND SOLIDS **12**

Determination of Areas and Volumes - First moment of area and the centroid - second and product moments of plane area - Parallel axis theorems and perpendicular axis theorems - Polar moment of inertia - Principal moments of inertia of plane areas - Principal axes of inertia - Mass moment of inertia - relation to area moments of inertia.

5. FRICTION **4**

Frictional Force - Laws of Coloumb friction - Simple Contact friction - Rolling Resistance - Belt Friction.

6. DYNAMICS OF PARTICLES **16**

Displacement, Velocity and acceleration their relationship - Relative motion - Curvilinear motion - Newton's Law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies.

7. ELEMENTS OF RIGID BODY DYNAMICS **8**

Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion - Moment of Momentum Equations - Rotation of rigid Body - Work energy equation.

Total No of periods: 60

GE131 Engineering Mechanics **3** **1** **0** **4**

Text Books:

1. *Beer and Johnson, " Vector Mechanics for Engineers ", Vol. 1 " Statics " and Vol. 2 " Dynamics ", McGraw Hill International Edition, 1995.*
2. *Merriam, " Engineering Mechanics ", Vol.1 " Statics " and Vol.2 " Dynamics 2/e ", Wiley International, 1988.*

References:

1. *Rajasekaran S. and Sankara Subramanian, G., " Engineering Mechanics - Statics and Dynamics ".*
2. *Irving, H., Shames, " Engineering Mechanics - Statics and Dynamics ", Thrid Edition, Prentice-Hall of India Pvt.Ltd., 1993.*
3. *Mokoshi, V.S., " Engineering Mechanics ", Vol.1 " Statics " and Vol.2 " Dynamics ", Tata McGraw Hill Books, 1996.*
4. *Timoshenko and Young, " Engineering Mechanics ", 4/e, McGraw Hill, 1995.*
5. *McLean, " Engineering Mechancis ", 3/e, SCHAUM Series, 1995.*

MA131 Mathematics I **3 1 0 4**

. (Revised Syllabus For B.E. / B.Tech. Programmes - Effective From June 2002)

1. MATRICES **9**

Characteristic equation - Eigen values and eigen vectors of a real matrix. Some properties of eigen values, Cayley-Hamilton theorem, Orthogonal reduction of a symmetric matrix to diagonal form - Orthogonal matrices - Reduction of quadratic form to canonical form by orthogonal transformation.

2. THREE DIMENSIONAL ANALYTICAL GEOMETRY **9**

Direction cosines and ratios - Angle between two lines - Equation of a plane - Equation of a straight line - Co-planer lines - Shortest distance between skew lines - Sphere - Tangent plane - Plane section of a sphere - orthogonal spheres.

3. GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS **9**

Curvature - cartesian and polar coordinates - Circle of curvature - Involutes and Evolutes - Envelopes - properties of envelopes - Evolute as envelope of normals.

4. FUNCTIONS OF SEVERAL VARIABLES **9**

Functions of two variables - Partial derivatives - Total differential - Differentiation of implicit functions - Taylor's expansion - Maxima and Minima - Constrained Maxima and Minima by Lagrangean Multiplier method - Jacobians - differentian under integral sign.

5. ORDINARY DIFFERENTIAL EQUATIONS **9**

Simultaneous first order linear equations with constant coefficients - Linear equations of second order with constant and variable coefficients - Homogeneous equation of Euler type - equations reducible to homogeneous form - Method of reduction of order - Method of variation of parameters.

6. TUTORIAL **15**

Total No of periods: 60

MA131 Mathematics I **3 1 0 4**

Text Books:

1. *Kreyszig, E., " Advanced Engineering Mathematics " (8th Edition), John Wiley and Sons (Asia) Pte Ltd., Singapore, 2001*
2. *Veerarajan, T., " Engineering Mathematics ", Tata McGraw Hill Publishing Co., NewDelhi, 1999.*

References:

1. *Grewal, B.S., " Higher Engineering Mathematics " (35th Edition), Khanna Publishers, Delhi , 2000.*
2. *Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " Engineering Mathematics ", Volume I (4th Revised Edition), S. Chand & Co., New Delhi, 2000.*
3. *Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " Advanced Mathematics for Engineering Students ", VolumeI (2nd Edition), S. Viswanathan (Printers & Publishers), 1992.*
4. *Venkataraman, M.K. " Engineering Mathematics - First year " National Publishing Company, Chennai (2nd Edition), 2000.*

PH131 Physics I	**2**	**1**	**2**	**4**

1. PROPERTIES OF MATTER **9**

Elasticity - stress-strain diagram-factors affecting elasticity - Twisting couple on a wire-Shafts-Torsion pendulum-Depression of a cantilever- Young's modulus by cantilever-Uniform and Non Uniform bending-I shape girders-Production and measurement of high vacuum-Rotary pump-Diffusion pump-Pirani Gauge-Penning gauge-Viscosity-Oswald Viscometer-Comparision of viscosities.

2. ACOUSTICS **9**

Acoustics of buildings-Absorption coefficient-Intensity-Loudness-Reverberation time-Sabine's formula-Noise pollution-Noise control in a machine-Ultrasonics-production-Magnetostriction and Piezoelectric methods-Applications of ultrasonics in Engineering and Medicine.

3. HEAT AND THERMODYNAMICS **9**

Thermal conductivity-Forbe's and Lee's Disc methods-Radial flow of heat-Thermal conductivity of rubber and glass-Thermal insulation in buildings-Laws of thermodynamics-Carnot's cycle as heat engine and refrigerator-Carnot's theorem-Ideal Otto and Diesel engines-Concept of entropy-Entropy Temperature diagram of carnot's cycle.

4. OPTICS **9**

Photometry-Lummer Brodhum photometer-Flicker Photometer-Antireflection coating-Air wedge-Testing of flat surfaces-Michelson's Interferometer and its applications-Photoelasticity and its applications-Sextant-Metallurgical microscope-Scanning electron microscope.

5. LASER AND FIBRE OPTICS **9**

Principle and lasers-laser characteristics-Ruby-NdYAG, He-Ne, CO2 and semiconductor lasers-propagation of light through optical fibers-types of optical fibre-Applications of optical fibres as optical waveguides and sensors.

6. PRACTICALS **30**

1. Young's modulus by nonuniform bending
2. Rigidity modulus and moment of inertia using Torsion Pendulum
3. Viscosity of a liquid by Poiseuille's method
4. Wavelength determination using grating by Spectrometer
5. Particle size determination by Laser
6. Thermal conductivity by Lees' disc.
7. Thickness of wire by Air wedge
8. Thermo emf measurement by potentiometer

Total No of periods: 75

PH131 Physics I	**2**	**1**	**2**	**4**

Text Books:

1. Arumugam.M., " Engineering Physics ", Anuradha Publications, 1998.

References:

1. *Resnik R. and Halliday D., " Physics ", Wiley Eastern, 1986.*
2. *Nelkon M. and Parker.P., " Advanced Level Physics ", Arnald-Heinemann, 1986.*
3. *Vasudeva A.S., " Modern Engineering Physics ", S. Chand and Co., 1998..*
4. *Gaur, R.K., and Gupta, S.L., " Engineering Physics ", Dhanpat Rai and Sons, 1988.*
5. *Mathur, D.S, " Elements of properties of Matter ", S.Chand & Co., 1989.*

GE132 Computer Practice I	**1**	**0**	**3**	**3**

1. FUNDAMENTALS OF COMPUTERS AND OPERATING SYSTEMS **4**

Evolution of Computers - Organization of Modern Digital Computers-Single user Operating System-Multitasking OS-GUI

2. OFFICE AUTOMATION **11**

a) Word Processing
b) Data Base Management System
c) Spread Sheet Package
d) Presentation Software

3. PRACTICALS **45**

Total No of periods: 60

Text Books:

1. *Ghosh Dastidar, Chattopadhyay and Sarkar, " Computers and Computation - A Beginner's Guide ", Prentice Hall of India, 1999.*

References:

1. *Nelson, Microsoft Office 97, Tata McGraw Hill, 1999.*
2. *Taxali, " PC Software for Windows Made Simple ", Tata McGraw Hill, 1999.*

GE133 Workshop Practice	**0**	**0**	**4**	**2**

1. SHEET METAL **10**

Tools and Equipments - Fabrication of tray, cone, etc., with sheet metal

2. WELDING **10**

Tools and Equipemts - Arc Welding of butt joint, Tap Joint, Tee fillet etc., Demonstration of gas welding.

3. FITTING **10**

Tools and Equipments- Practice in Chipping, Filling, Drilling - making Vee joints, square and dove tail joints.

4. CARPENTRY **10**

Tools and Equipments-Planning Practice-making halving joint and dove tail joint models.

5. FOUNDRY **10**

Tools and Equipments Preparation of moulds of simple objects like flange, gear V- grooved pulley etc.

6. SMITHY **10**

Tools and Equipments - Demonstration for making simple parts like keys, bolts etc.

Total No of periods: 60

GE133 Workshop Practice	**0**	**0**	**4**	**2**

References:

1. *Venkatachalapathy V.S., " First Year Engineering Workshop Practice ", Raamalinga Publications, Madurai, 1999.*
2. *Kanaiah P.and Narayana K.C., " Manual on Workshop Practice Scitech Publications ", Chennai, 1999.*

CM132 Chemistry II **3 0 0 3**

1. ORGANIC REACTIONS AND THERMOCHEMISTRY **12**

Organic reactions and mechanisms - Law of mass action - Enthalpy, entropy and free energy - industrial enthalpy balances, free energies of metallic compounds - Ellingham diagram - metallurgical and multicomponent equilibria - Phase rule for metallurgical reactions - Refractory materials.

2. POLYMER AND CERAMIC MATERIALS **8**

Commodity and Engineering plastics, polymer blends and alloys - Moulding compounds - powder, DMC, SMC, liquid resin - Composites - Fibres - Ceramics - Glass.

3. ELECTROCHEMISTRY **10**

Principles - Reversible and irreversible cells - Electromotive series - Electro winning - metallurgy - applications - sensors - electrochemical machining -Metal processing - Corrosion and its prevention.

4. EXTRACTIVE METALLURGY AND ALLOYS **10**

Ores - ore dressing - Extraction processes - Alloys - phase diagrams - Iron-Carbon systems - Heat treatment - Non ferrous and special alloys.

5. POWDER METALLURGY **5**

Principles - compacting and sintering methods - applications.

Total No of periods: 45

CM132 Chemistry II **3 0 0 3**

Text Books:

1. *Dara S.S., " A text book of Engineering Chemistry ", S.Chand and Company Ltd., 1996.*

References:

1. *Christopher, Brett M.A., " Electrochemistry, Principles, Methods and applications, Oxford University Press, 1993.*
2. *Raymond A. Higgins, " Engineering Metallurgy ", Part I, " Applied Physical Metallurgy ", ELBS, 1983.*
3. *Everett R.K., Arsenault R.J., " Metal Matrix composites mechanisms and properties ", Academic Press, 1991.*
4. *Utracki L.A., " Polymer alloys and Blends ", Hanser Publishers, 1990.*

EC152 Electronics Engineering **2 0 2 3**

1. SEMICONDUCTORS AND RECTIFIERS **9**

Classification of solids based on energy hand theory - Intrinsic semiconductors - Extrinsic semiconductors - P type and N type - P-N junction - VI characteristic of PN junction diode - Zener effect - Zener diode - Zener diode characteristic - Half wave and full wave rectifiers - Voltage regulation.

2. TRANSISTORS AND AMPLIFIERS **9**

Bipolar Junction Transistor - CB, CE, CC - Configurations and characteristics - Biasing circuits - Elementary treatment of voltage amplifier - Class A, B and C power amplifiers - principles of Tuned amplifiers.

3. POWER AND CONTROL ELECTRONIC DEVICES **9**

Field Effect Transistor - Configurations and characteristics - FET amplifier - SCR, Diac, Triac, UJI - Characteristics and simple applications - switching transistors - concept of feed back - negative feed back - application in temperature and motor speed control.

4. SIGNAL GENERATORS AND LINEAR IC'S **9**

Sinusoidal oscillators - positive feed back - RC phase shift, Hastley, Colpit's, Wien bridge Oscillators - multivibrators - operational amplifier - adder, multiplier, integrator and differentiators - Integrated circuits.

5. DIGITAL ELECTRONICS **9**

Binary number system - AND, OR, NOT, NAND, NOR circuits - Boolean algebra - Exclusive or gate - Half and full adders - flip flops - registers and counters - A/D, D/A conversion - Digital computer principle.

6. TUTORIAL **15**

Total No of periods: 60

EC152 Electronics Engineering **2 0 2 3**

Text Books:

1. *Milman and Halkias, " Integrated Electronics ", McGraw Hill, 1979.*

References:

1. *Mehta,V.K., " Principles of Electronics ", S.Chand and Company Ltd., 1994.*
2. *Malvino & Leach, " Digital Principles and Applications ", McGraw Hill, 1986.*

EE151 Electrical Engineering **2 0 0 2**

1. ELECTRICAL CIRCUITS **9**

Ohms 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 3 phase balanced circuits.

2. ELECTRICAL MACHINES **15**

Principles of operation and characteristics of DC machines, Transformers (single phase and three phase) - Synchronous Machines - 3 Phase and single phase Induction motors - (op. principles).

3. ELECTRICAL MEASUREMENTS **6**

Moving coil and moving iron instruments (Ammeter and Voltmeter) Dynamometer type watt meters and energy meters (op. principles).

4. PRACTICAL **30**

Total No of periods: 60

Text Books:

1. *Mittle, V.N., " Basic Electrical Engineering ", TMH Edition, New Delhi, 1990.*
2. *Del Toro, " Electrical Engineering Fundamentals ", Prentice Hall of India Pvt.Ltd., New Delhi, Second Edition.*

References:

1. *Jimmie J.Cathey and Nasar, S.A., " Basic Electrical Engineering ", Schaurn outline series in Engineering, McGraw Hill Book Co.1987.*
2. *Deshpande, N.V., " Electrical Machines " A.A.Wheeler and Co. Ltd., New Delhi, 1994.*

MA132 Mathematics II **3 1 0 4**

. (Revised Syllabus For B.E. / B.Tech. Programmes - Effective From June 2002)

1. MULTIPLE INTEGRALS **9**

Double integration in Cartesian and polar coordinates - Change of order of integration - Area as a double integral - Triple integration in Cartesian coordinates - Change of variables - Gamma and Beta functions.

2. VECTOR CALCULUS **9**

Curvilinear coordinates - Gradient, Divergence, Curl - Line, surface & volume integrals - Statements of Green's, Gauss divergence and Stokes' theorems - Verification and applications.

3. ANALYTIC FUNCTIONS **9**

Cauchy Riemann equations - Properties of analytic functions - Determination of harmonic conjugate - Milne-Thomson's method - Conformal mappings : Mappings
w = z +a, az, 1/z, z2 and bilinear transformation.

4. COMPLEX INTEGRATION **9**

Cauchy's theorem - Statement and application of Cauchy's integral formulae - Taylor's and Laurent's expansions - Singularities - Classification - Residues - Cauchy's residue theorem - Contour integration - Circular and semi Circular contours (excluding poles on real axis).

5. STATISTICS **9**

Moments - Coefficient of correlation - Lines of regression - Tests based on Normal and t distributions, for means and difference of means - Chi Square test for goodness of fit.

Total No of periods: 45

MA132 Mathematics II **3 1 0 4**

Text Books:

1. *Kreyszig, E., " Advanced Engineering Mathematics " (8th Edition), John Wiley and Sons, (Asia) Pte Ltd.,Singapore, 2000.*
2. *Grewal, B.S., " Higher Engineering Mathematics " (36th Edition), Khanna Publishers, Delhi 2001*

References:

1. *Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " Engineering Mathematics ", Volumes I & II (4th Revised Edition), S. Chand & Co., New Delhi, 2001.*
2. *Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " Advanced Mathematics for Engineering Students ", Volumes I & II (2ndEdition), S.Viswanathan (Printers & Publishers, Pvt, Ltd.), 1992.*
3. *Venkataraman, M.K. " Engineering Mathematics III - A ", National Publishing Company, Chennai, (13th Edition), 1998.*

ME132 Thermodynamics **3 0 0 3**

1. BASIC CONCEPT AND FIRST LAW **9**

Basic definitions, Microscopic and macroscopic approaches concept of continuous, types of systems and processes, point and path functions, Thermodynamic equilibrium and quasi-static equilibrium, Zeroth Law, First Law applied to closed systems, Control volume, steady and unsteady flow processes.

2. SECOND LAW, ENTROPY AND AVAILABILITY **9**

Kelvin-Planck and clausius statements, heat engines and heat pumps, efficiency and COP, Corollaries of II Law, Carnot cycle. Principle of entropy increase, p-v and T-s diagram, available energy, availability in closed and open systems.

3. IDEAL AND REAL GASES AND THERMODYNAMIC RELATIONS **9**

Equation of state, vander walls - Dieterici - Berthelot - Redlick - kwang equations, Virial expansions. Generalised compressibility chart, ideal gas mixtures - property calcuation, Maxwell's equations, clapeyron equation, Relations for internal energy, enthalpy and entropy, Cp & Cv Joule-Thomson Coefficient.

4. PROPERTIES OF STEAM AND PSYCHROMETRY **9**

Steam formation, PVT surface, Use of steam tables and Mollier chart, dryness fraction measurement.

Psychrometric properties, simple psychrometric processes and use of charts.

5. FUELS AND COMBUSTION **9**

Solid, Liquid and gaseous fuels, fuel properties, enthalpy of formation, Heating values, adiabatic flame temperature.

Combustion equations, stoichiometric air requirements, excess air ratio, air fuel ratio, exhaust gas compositions, flue gas analysis, air-fuel ratio from exhaust gas composition.

Total No of periods: 45

ME132 Thermodynamics **3 0 0 3**

Text Books:

1. *Yadav R., " Thermodynamics and Heat Engines ", Vol. I, Central Publishing House (1995).*
2. *Nag P.K.., " Engineering Thermodynamics ", Tata McGraw Hill (1995).*

References:

1. *Sarkar, B.K., " Thermal Engineering", Tata McGraw Hill Co. Ltd. (1998).*
2. *Ramalingam, K.K., " Internal Combustion Engines - Theory and Practice ", Scitech. Publications (1999).*
3. *Dr.Yunus A.Cengel and Dr.Michael A. Boles, " Thermodynamics - An Engines Approach ", 2nd Edition, McGraw Hill Ind., N.J., 1994.*
4. *Robert Balmer, " Thermodynamics ", M/s.Jaico Publishing Co., 1998.*

GE134 Engineering Graphics **1 0 3 3**

1. PRINCIPLES OF GRAPHICS **16**

Two dimensional geometrical construction - Conic sections, involutes and cycloids - Representation of three dimensional objects - Principles of projections - standard codes of principles.

2. ORTHOGRAPHIC PROJECTIONS **28**

Projections of points, straight line and planes - Auxiliary projections - Projection and sectioning of solids - Intersection of surfaces - Development of surfaces.

3. PICTORIAL PROJECTIONS **8**

Isometric projections - Perspectives - Free hand sketching.

4. COMPUTER GRAPHICS **8**

Hardware - Display technology - Software - Introduction to drafting software.

Total No of periods: 60

Text Books:

1. *Narayanan, K.L., and Kannaiah, P., " Engineering Graphics ", Tata McGraw-Hill Publishers Co., Ltd., 1992.*

References:

1. *William M. Neumann and Robert F.Sproul, " Principles of Computer Graphics ", McGraw Hill, 1989.*
2. *Warren J. Luzzadder and John M. Duff, " Fundamentals of Engineering Drawing ", Prentice-Hall of India Private Ltd., Eastern Economy Edition, 1995.*
3. *Natarajan K.V., " A Text Book of Engineering Drawing ", Private Publication, Madras, 1990.*
4. *Mathur, M.L. and Vaishwanar, R.S., " Engineering Drawing and Graphics ", Jain Brothers, New Delhi, 1993.*

GE135 Computer Practice II **1 0 3 3**

1. MULTIUSER OPERATING SYSTEM **4**

Unix: Introduction - Basic Commands - Vi editor - filters - Input/output redirection - piping - transfer of data between devices - shell scripts.

2. FUNDAMENTALS OF NETWORKING **3**

Working on a networked environment - Accessing different machines from one node - concept of E-mail - Uses of Internet.

3. HIGH LEVEL LANGUAGE PROGRAMMING **8**

C Language: Introduction - Operator - Expressions - Variables - Input/output statements - control statements - function arrays - pointer - structures - unions - file handling - case studies.

4. PRACTICALS **45**

Total No of periods: 60

Text Books and References:

1. *Stephan J. Kochen & Patrick H. Wood, " Exploring the UNIX System ", Techmedia, 1999.*
2. *Maurice J. Bach, " The design of UNIX Operating Systems ", Prentice Hall of India, 1999.*
3. *Ramos, " Computer Networking Concepts ", Prentice Hall International, 1999.*
4. *Balagurusamy, " Programming in ANSI C ", Tata McGraw Hill, 1999.*
5. *Kernighan and Ritchie, " The C Programming Language ", Prentice Hall of India, 1999.*
6. *Gottfried, " Programming with C ", Tata McGraw Hill, 1999.*
7. *Kutti, " C and UNIX Programming: A Conceptual Perspective ", Tata McGraw Hill, 1999.*
8. *Eric Nagler, " Learning C++ ", M/s. Jaico Publishing Co., 1998-99.*

CE253 Fluid Mechanics and Machinery **3 1 0 4**

1. INTRODUCTION **5**

Units and Dimensions for Fluid Mechanics - Properties of fluids - density, specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws - Capillarity and surface tension.

2. FLUID FLOW CONCEPTS AND BASIC EQUATIONS **10**

Flow characteristics, concepts of system and control volume - Continuity equation - application of control volume to continuity - Energy equation - Euler equation - Bernoulli equation and Momentum equation.

3. FLOW THROUGH CIRCULAR CONDUITS **10**

Laminar flow through circular tubes and Annuli boundary layer concepts - Boundary layer thickness - Hydraulic and energy gradient - Darcy equation on pipe roughness - Friction factor - Moody diagram - Minor losses - Flow through pipes in series and in parallel - Commercial pipes.

4. DIMENSIONAL ANALYSIS **5**

Dimensions and units, the Buckingham II theorem. Discussions on dimensionless parameters - Models and similitude - Application of dimensionless parameters.

5. ROTODYNAMIC MACHINES **10**

Homologous units, specific speed, elementary cascade theory, theory of turbo machines, Euler's equation, Hydraulic efficiency, Velocity components at entry and exit of a rotor - Velocity triangle for single stage radial flow and axial flow machines, Centrifugal pumps, turbines, performance curves for pumps and turbines.

6. POSITIVE DISPLACEMENT MACHINES **5**

Reciprocating pumps, indicator diagram, work saved by air vessles - Rotary pumps, classification, working, performance curves.

7. TUTORIAL **15**

Total No of periods: 60

CE253 Fluid Mechanics and Machinery **3 1 0 4**

Text Books:

1. *Kumar K.L., " Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd., New Delhi, (7th Edition), 1995.*
2. *Bansal R.K., " Fluid Mechanics and Hydraulic Machines ", (5th Edition), Laxmi Publications (P) Ltd., New Delhi, 1995.*
3. *Roberson J.A. & Crowe C.T., " Engineering Fluid Mechanics ", M/s Jaico Publishing Co., 1998-99.*

References:

1. *Streeter V.L. and Wylie E.B., " Fluid Mechanics ", McGraw Hill, 1983.*
2. *Ramamirtham S., " Fluid Mechanics, Hydraulics and Fluid Machines ", Dhanpat Rai & Sons, Delhi, 1988.*

EE252 Electrical Machines and Drives **2 0 2 3**

1. INTRODUCTION **4**

Types of electrical drives - factors influencing the choice of electrical drives, heating and cooling curves - loading conditions and classes of duty - determination of power rating.

2. ELECTRICAL MOTORS CHARACTERISTICS **6**

Speed - Torque and braking characteristics, DC motors, three phase and single phase induction motors.

3. STARTING METHODS **6**

Types of DC and AC motors starters - typical control circuits for DC series and shunt motors - three phase cage and slip ring induction motors, protective devices for the same.

4. CONVENTIONAL SPEED CONTROLS **6**

Speed control of DC series and shunt motors - armature and field control Ward - leonard control system - three phase induction motor - voltage, frequency and slip power control.

5. SOLID STATE SPEED CONTROL **8**

(Power Circuit and Qualitative treatment only) Control of DC drives using rectifiers and choppers Control of three phase induction motors using stator voltage control - Voltage/frequency control and slip power recovery schemes, electrical power distribution schemes, substations and earthing (including that of mines).

6. PRACTICALS **30**

Speed control of DC shunt Motor - Load test on DC compound Motor - Load test on DC Series motor - Load test on 3 phase Induction motor - Study of Induction Motor starters.

Total No of periods: 60

EE252 Electrical Machines and Drives **2 0 2 3**

Text Books:

1. *Partab H., " Art and Science of Utilisation of Electrical Energy ", Dhanpat Rai and Sons, Delhi, 1985.*

References:

1. *Pillai, S.K., " A First Course on Electrical Drives ", Wiley Eastern Ltd., New Delhi, 1982.*

MA231 Mathematics III **3 1 0 4**

. (Revised Syllabus For B.E. / B.Tech. Programmes - Effective From June 2002)

1. PARTIAL DIFFERENTIAL EQUATIONS **9**

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

2. FOURIER SERIES **8**

Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity - Harmonic Analysis.

3. BOUNDARY VALUE PROBLEMS **9**

Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

4. LAPLACE TRANSFORMS **9**

Transforms of simple functions - Basic operational properties - Transforms of derivatives and integrals - Initial and final value theorems - Inverse transforms - Convolution theorem - Periodic functions - Applications of Laplace transforms for solving linear ordinary differential equations upto second order with constant coefficients and simultaneous equations of first order with constant coefficients.

5. FOURIER TRANSFORMS **10**

Statement of Fourier integral theorem - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

Total No of periods: 45

MA231 Mathematics III **3 1 0 4**

Text Books:

1. *Kreyszig, E., " Advanced Engineering Mathematics " (8th Edition), John Wiley and Sons, (Asia) Pte Ltd.,Singapore, 2000.*
2. *Grewal, B.S., " Higher Engineering Mathematics " (35th Edition), Khanna Publishers, Delhi 2000.*

References:

1. *Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " Engineering Mathematics ", Volumes II & III (4th Revised Edition), S. Chand & Co., New Delhi, 2001.*
2. *Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " Advanced Mathematics for Engineering Students ", Volumes II & III (2ndEdition), S.Viswanathan (Printers & Publishers, Pvt, Ltd.) 1992.*
3. *Venkataraman, M.K. " Engineering Mathematics " Volumes III - A & B, 13th Edition National Publishing Company, Chennai, 1998.*
4. *Shanmugam, T.N. : http://www.annauniv.edu/shan/trans.htm*

ME231 Applied Thermodynamics **3 0 0 3**

1. STEAM NOZZLES **8**

Flow of steam through nozzles, shape of nozzles, effect of friction, critical pressure ratio, supersaturated flow.

2. AIR COMPRESSORS **10**

Reciprocating Compressor - Multistage Operation, Effect of Clearance, Volumetric Efficiency.

Rotary Compressors, Vane type, Roots Blower, Screw Compressors, Centrifugal Compressors.

3. AIR POWER CYCLES **10**

Otto, Diesel and Dual Cycles, Air-standard Efficiency, Mean Effective Pressure and Power. Brayton cycle with reheat and regeneration.

4. VAPOUR POWER AND COMBINED CYCLES **7**

Ranking cycle, Reheating and Regeneration Cycles, Binary Vapour Cycles.

5. REFRIGERATION **10**

Air-refrigeration cycle, vapour compression refrigeration cycle - subcooling and superheating cycles, vapour absorption cycles, cryogenic cycles.

Total No of periods: 45

ME231 Applied Thermodynamics **3 0 0 3**

Text Books:

1. *Yadav R., " Thermodynamics and Heat Engines ", Vol. 2, Central Publishing House, Allahabad, (1995).*
2. *Ballaney O.L., " Thermal Engineering ", Khanna Publishers, (1990).*

References:

1. *Holman, J.P., " Thermodynamics ", McGraw Hill Book Company (1988).*
2. *Rai, K.S. and Sarao, " Thermal Engineering ", Satya Prakashan (1990).*
3. *Sarkar, B.K., " Thermal Engineering ", Tata McGraw Hill Co., Ltd. (1998).*
4. *Ramalingam, K.K., " Internal Combustion Engines-Theory and Practice ", Scitech Publications (1999).*
5. *Jones J.B. and Dugan R.E., " Engineering Thermodynamics ", Prentice Hall of India, 1998.*
6. *Nag P.K., " Engineering Thermodynamics ", Tata McGraw Hill Publishing Co., Ltd., 1995.*
7. *Ramanathan B., " Engineering Thermodynamics ", Bharath Publishing Co., Madras, 1991.*

ME232 Kinematics of Machines **3 1 0 4**

1. BASICS OF MECHANISMS **7**

Terminology and Definitions - Degree of Freedom Mobility - Kutzbach criterion - Grashoff's law - Kinematic Inversions of 4-bar chain and slider crank chains - Mechanical Advantage - Transmission angle - Description of common mechanisms - Single, double and offset slider mechanisms - Quick return mechanisms - Snap-action Mechanisms - Linear actuators - Motion Adjustment mechanisms clamping mechanisms - Ratchets and escapements - Indexing Mechanisms - Rocking Mechanisms - Straight line generators - Design of Crank-rocker Mechanisms.

2. KINEMATICS **12**

Displacement, velocity and acceleration and analysis in simple mechanisms - Graphical Method velocity and acceleration polygons - Instantaneous Centre of Velocity - Angular velocity ratio theorem - Kinematic analysis by Algebric methods - Complex Algebra methods - Vector Approach, Computer applications in the kinematic analysis of simple mechanisms - Coincident points - Coriolis Acceleration.

3. KINEMATICS OF CAM **8**

Classifications - Displacement diagrams - parabolic Simple harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion - Pressure angle and undercutting.

4. GEARS **10**

Spur gear Terminology and definitions - Fundametal Law of toothed gearing and involute gearing - Inter changeable gears - gear tooth action - Terminology - Interference and undercutting - Non standard gear teeth - Helical, Bevel, Worm, Rack and Pinion gears (Basics only) - Gear trains - Parallel axis gear trains - Epicyclic gear trains - Differentials - Automotive transmission gear trains.

5. FRICTION **8**

Surface contacts - Sliding and Rolling friction - Friction angle - Friction in screws with square thread - Friction in V threads - Friction drives - Friction clutches - Belt and rope drives, Friction aspects in Brakes - Friction in the Propulsion and braking of vehicles - tractive resistance.

6. TUTORIAL **15**

Total No of periods: 60

ME232 Kinematics of Machines **3** **1** **0** **4**

Text Books:

1. *Shigley J.E. and Uicker J.J., " Theory of Machines and Mechanisms ", McGraw Hill, Inc., 1995.*

References:

1. *Thomas Bevan, " Theory of Machines ", CBS Publishers and Distributors, 1984.*
2. *Ghosh A. and Mallick A.K., " Thoery of Mechanisms and Machines ", Affiliated East-West Pvt.Ltd., New Delhi, 1988.*
3. *Rattan S.S., " Theory of Machines ", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.*
4. *Rao J.S. and Dukkipati R.V., " Mechanism and Machine Theory ", Wiley-Eastern Limited., New Delhi, 1992.*
5. *John Hannah and Stephens R.C., " Mechanics of Machines ", Viva Low-Prices Student Edition, 1999.*

ME234 Machine Drawing **1 0 3 2**

1. DRAWING STANDARDS **6**

Code of Practice for Engineering Drawing, BIS specifications - Welding symbols, riveted joints, Cotters, keys, fasteners - Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc.

2. FITS AND TOLERANCES **6**

Fits and tolerance - allocation of fits for various mating parts - tolerance data sheet - tolerance table preparation - Geometric tolerance.

3. ASSEMBLY DRAWING **12**

Preparation of assembled views given parts details - couplings: flange, universal - Bearing: footstep, Plummer block - Lathe tailstock - Stop valves - etc.

4. DETAIL DRAWING **12**

Preparation of parts details given assembled views - screw jack - connecting rod ends - cross heads - etc.

5. ACUTAL MEASUREMENT OF DIMENSIONS AND DRAWING PRACATICE **24**

The students must be made to disassemble machines and take actual dimensions and prepare parts drawings, assembly drawings, exploded views and isometric views as record work.

Some Machines of Interest are:

1. Lathe Chuck
2. Gear Reducer
3. Gear Pump
4. Steam Stop Valve
5. Pneumatic Cylinder assembly
6. Pneumatic Valves
7. Centrifugal pump assembly
8. I.C.Engine Cylinder - Piston, Connection rod and Crankshaft assembly
9. Automobile Gear Box
10. Clutch Assembly

Note : The Examination must include :

1) Total assembly Test
2) Identifying the missing element of the assembly
3) A Drawing test

Total No of periods: 60

ME234 Machine Drawing **1 0 3 2**

Text Books:

1. *Bhatt, N.D., " Machine Drawing ", Published by R.C.Patel, Chartstar Book Stall, Anand, India, 1997.*
2. *P.S.G. Design Data Book.*

References: Book:

1. *Sidheswar, N., Kanniah, P. and Sastry, V.V.S., " Machine Drawing ", Tata McGraw Hill, 1997.*

CE251 Strength of Materials **3 0 0 3**

1. STRESS, STRAIN AND DEFORMATION OF SOLIDS **6**

Rigid bodies and deformable solids - Stability, Strength and Stiffness - Tension, Compression and Shear Stresses - Deformation of simple and compound bars - Thermal Stresses - Elastic Constants.

2. TRANSVERSE LOADING ON BEAMS **6**

Beams - Types and transverse loading on beams - Shear force and bending moment in beams - Cantilevers - Simply supported beams and over-handing beams.

3. STRESSES IN BEAMS **6**

Theory of simple bending - Analysis of stress - Local carrying capacity - Proportioning sections - leaf springs - Flitched beams - Shear Stree distribution - Shear flow.

4. TORSION **6**

Stresses and deformation in circular and hollow shafts - Stepped shafts - Shafts fixed at both the ends - Stresses in helical springs - Deflection of springs - Design of buffer springs.

5. ANALYSIS OF STATES OF STRESS (TWO DIMENSIONAL) **7**

Biaxial state of stress - Thin cylinders and shells - Deformation of thin cylinders and shells - Stresses at a point - Stress as tension - Stresses on inclined planes - Principal stresses and principal planes - Mohr's circle of stress.

6. DEFLECTION OF BEAMS **7**

Double integration method - Macaulay's method - Area moment theorems for computation of slopes and deflections in beams - Conjugate beam method.

7. ENERGY PRINCIPLES **7**

Strain energy and strain energy density - Strain energy in traction, shear flexure and torsion - Castigliano's and Engessor's energy theorems. Principle of virtual work - Application of energy theorems for computing deflection in beams - Maxwell's reciprocal theorem.

Total No of periods: 45

CE251 Strength of Materials **3 0 0 3**

Text Books:

1. *Egor P. Popov, " Engineering Mechanics of Solids ", Prentice hall of India, New Delhi, 1997.*
2. *Srinath L.N., " Advanced Mechanics of Solids ", Tata McGraw Hill Publishing Company Ltd., New Delhi.*

References:

1. *Junarkar S.B., " Mechanics of Structures ", Vol. 1, 21st Edition, Charotar Publishing House, Anand, India, 1995.*
2. *Kazimi S.M.A., " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1981.*
3. *Laudner T.J. and Archer R.R., " Mechanics of Solids in Introduction ", McGraw Hill International Editions, 1994.*
4. *William A.Nash, " Theory and Problems of Strength of Materials ", Schaum's Outline Series, McGraw Hill International Editions, Third Edition, 1994.*
5. *Elangovan A., " Thinmavisaiyiya ", Mechanics of Solids in Tamil, Anna Unviersity, Chennai, 1995.*

MA038 Numerical Methods **3 1 0 4**

1. SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS **9**

Iterative method, Newton-Raphson method for single variable and for simultaneous equations with two variables., Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobi and Gauss-Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power and Jacobi Methods.

2. INTERPOLATION **9**

Newton's divided difference formulae, Lagrange's and Hermite's polynomials, Newton forward and backward difference formulae, Stirling's and Bessel's Central difference formulae.

3. NUMERICAL DIFFERENTIATION AND INTEGRATION **9**

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both 1/3 rd and 3/8 th) rules. Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS **9**

Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of order four for first and second order differential equations. Multistep Methods - Milne and Adam's-Bashforth predictor and corrector methods.

5. BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS **9**

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

6. TUTORIAL **15**

Total No of periods: 60

MA038 Numerical Methods **3 1 0 4**

Text Books:

1. *Sastry, S.S., " Introductory Methods of Numerical Analysis (Third Edition) ", Printice Hall of India, New Delhi 1998.*

References:

1. *Kandasamy, P., Thilakavathy, K. and Gunavathy, K., " Numerical Methods ", S. Chand & Co., New Delhi, 1998.*
2. *Grewal, B.S. and Grewal, J.S., " Numerical Methods in Engineering and Science ", Khanna Publishers, New Delhi, 1999.*
3. *Jain M.K., Iyengar, S.R.K. and Jain, R.K., " Numerical Methods for Engineering and Scientific computation (Third Edition) ", New Age International (P) Ltd., New Delhi, 1995.*
4. *Gerald, C.F. and Wheatley, P.O., " Applied Numerical Analysis (Fifth Edition) ", Addison Wesley, Singapore, 1998.*
5. *Narayanan, S., Manickavachakam Pillai, K. and Ramanaiah, G., " Advanced Mathematics for Engineering Students - Volume-III ", S.Viswanathan Pvt., Ltd., 1993.*

ME235 Production Technology **3 0 0 3**

1. FOUNDRY TECHNOLOGY **10**

Pattern and Core making - Moulding sand - Melting furnaces - Special casting processes - Shell, Investment, Die casting, Full mould process - gating and Risering - Defects in casting - Testing and Inspection of casting.

2. FORMING TECHNOLOGY **8**

Cold and hot working - Forging, Rolling Extrusion Drawing and Deep drawing processes - Sheet metal forming - Blanking, Piercing, Punching, trimming, Shaving, Nibbing, Notching - Stretch forming - Embossing and coining - Bending - Nomenclature of bending - Bend force - Types of dies - Progressive compound and combination dies.

3. WELDING TECHNOLOGY **10**

Classification - Arc Welding - Machines - Electrode types - Specification - Carbon Arc, TIG, MIG, Atomic hydrogen, Submerged Arc - Resistance welding, Gas welding - Types - Special welding - Laser, electron beam, Plasma Arc, Ultrasonic, Electro slag and Friction welding - Defects in weld - Testing and Inspection - Thermal welding - Brazing and soldering.

4. HIGH ENERGY RATE FORMING PROCESS (HERF) **7**

Explosive forming, Electro-hydraulic, Electro magnetic forming, dynapack machine.

5. PLASTIC MATERIALS AND PROCESSES **10**

Types of Plastics - Types of moulding - Compression moulding - Transfer moulding - Injection moulding - Blow moulding - Film and speat forming - Thermo forming - Reinforced plastic - Laminated plastics.

Total No of periods: 45

ME235 Production Technology **3 0 0 3**

Text Books:

1. *Sharma P.C., " A text book of Production Technology ", S.Chand & Company Ltd., New Delhi, 1996.*

References:

1. *Sharma P.C., " A text book of Production Technology ", S.Chand & Company Ltd., New Delhi, 1996.*
2. *Amstead B.H., " Manufacturing Processes ", Phillip F.Ostwald, L.Begemon, John Wiley and Sons., 8th Edition, 1998.*
3. *De Garmo, " Materials and Processes in Manufacturing ", Prentice Hall of India, 8th Edition, 1998.*
4. *Surender Kumar and Goutam Sutradhar, " Design and manufacturing - An Integrated Approach ", Oxford & IBH Publishers, 1998.*
5. *Banga T.R., Agarwal R.L. and Manghrani T., " Foundry Engineering ", Khanna Publishers, New Delhi-1995.*
6. *Rao P.N., " Manufacturing Technology - Foundry Forging & Welding ", Tata McGraw Hill Publishing Co., New Delhi-1998.*

ME236 Dynamics of Machines **3 1 0 4**

1. FORCE ANALYSIS **14**

Applied and Constraint Forces - Free body diagrams - Static Equilibrium conditions - two, three and four force members - Static force analysis in simple mechanisms - Dynamic force analysis - Inertia force and Inertia torque - D.Alemberts principle - The principle of superposition - Dyanamic Analysis in Reciprocating Engines - Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque - Turning moment diagrams - Fly wheels - Engine shaking Forces - Cam dynamics - Analysis of Rigid and Elastic body cam system - Unbalance, Spring, Surge and Windup.

2. BALANCING **8**

Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder Engine Balancing Multi-cylinder Engines - Partial balancing in locomotive Engines - Balancing linkages - balancing machines

3. FREE VIBRATION **7**

Basic features of vibratory systems - idealized models Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration critical speeds of simple shaft - Torsional systems.

4. FORCED VIBRATION **6**

Response to periodic forcing - Harmonic Forcing - Forcing caused by unbalance - Support motion - Force transmissibility and amplitude transmissibility Vibration isolation.

5. MECHANISM FOR CONTROL **10**

Governors - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors - Characteristics - Effect of friction - Controlling Force other Governor mechanisms.

Gyroscopes - Gyroscopic forces and Torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes - Introduction to Automatic Controls.

6. TUTORIAL **15**

Total No of periods: 60

ME236 Dynamics of Machines **3 1 0 4**

Text Books:

1. *Shigley J.E. and Uicker J.J., " Theory of Machines and Mechanisms ", McGraw Hill, Inc., 1995.*

References:

1. *Thomas Bevan, " Theory of Machines ", CBS Publishers and Distributors, 1984.*
2. *Ghosh A. and Mallick A.K., " Theory of Mechanisms and Machines ", Affiliated East-West Press Pvt.Ltd., New Delhi, 1988.*
3. *Rattan S.S., " Theory of Machines ", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1994.*
4. *Rao J.S. and Dukkipati R.V., " Mechanism and Machine Theory ", Wiley-Eastern Limited, New Delhi, 1992.*
5. *John Hannah and Stephens R.C., " Mechanics of Machines ", Viva low-Priced Student Edition, 1999.*

ME237 Thermal Engineering **3 1 0 4**

1. STEAM GENERATORS **7**

Types and Classifications, Low Pressure fire and water tube boilers - Mountings and Accessories - Criteria for selection of a boiler.

2. STEAM TURBINES **8**

Impulse and Reaction Principles, Compounding, Velocity diagrams for simple and multistage turbines, speed regulations - governors and nozzle governors

3. INTERNAL COMBUSTION ENGINES **10**

Actual cycles, Valve and port timings diagrams, Engine type and applications, Fuel supply, Ignition, Cooling and Lubrication system for SI and CI Engines.

4. COMBUSTION AND TESTING OF I.C. ENGINES **10**

Cetane and Octane numbers of fuels - Combustion, Knocking and detonation, Scavenging and supercharging - Performance testing of I.C Engines - Determination of frictional power and determination of various efficiencies - Heat balance calculations.

5. AIR CONDITIONING **10**

Principles of air-conditioning - Types of AC Systems - Summer, Winter Comfort and Year round air-conditioners, Design of air-conditioners - heat load calculations.

6. TUTORIAL **15**

Total No of periods: 60

ME237 Thermal Engineering **3 1 0 4**

Text Books:

1. *Domkundwar and Kothandaram, " Thermal Engineering ", Khanna Publishers, 1996.*
2. *Rajput R.K., " Thermal Engg. ", Laxmi Publications (P) Ltd., 1998.*

References:

1. *Yadav R., " Steam and Gas Turbines ", Control Publishing House, Allahabad, 1996.*
2. *Ganesan V., " Internal Combustion Engines ", Tata McGraw Hill, New Delhi, 1994.*
3. *Stoeckr W.P. and Jones J.W., " Refrigeration and Air conditioning ", Tata McGraw Hill, New Delhi, 1995.*
4. *Dossat R.J., " Principles of Refrigeration ", John-Wiley and Stoncs, 1994.*
5. *Rogers G.P.C. and Maynew Y.R., " ELBS with Longman ", 1996.*

PH233 Applied Materials Science **3 0 0 3**

1. CRYSTALLOGRAPHY AND STRENGTHENING MECHANISMS **9**

Crystalline and amorphous solids - Unit cell and primitive cell - Miller indices BCC, FCC and HCP crystal structures and their packing factors - Crystal defects - point defects and line defects (edge dislocation and screw dislocation). Effect of crystal imperfections in mechanical properties - strengthening mechanisms for the improvement of mechanical properties.

2. FRACTURE AND ITS PREVENTION **9**

Fracture - Mechanism of brittle fracture (Griffith's theory) and Ductile fracture - Difference between brittle and ductile fractures - Fatigue failure and its prevention - Creep - different stages in creep curve - Factors affecting creep resistant materials - Mechanism of creep fracture.

3. FERROUS ALLOYS **9**

Significance of phase diagram - Allotropy and phase change of pure iron - Classification of steels and cast iron - Iron - carbon equilibrium diagram - Microstructure of iron and steel - Ferrous alloys and their applications - Factors affecting mechanical properties - Grain size and heat treatment.

4. NONFERROUS METALS AND ALLOYS **9**

Factors affecting conductivity of a metal - Electrical resistivity in alloys - Thermal conductivity of metals and alloys - Silver, Copper and Aluminium - High resistivity alloys - nichrome, manganin, constantan and kanthal and their composition and applications - Super hard materials - Tungsten carbide and Boron nitride.

5. SURFACE ENGINEERING **9**

Surface heat treatment - Diffusion methods - Carburising, Nitriding, Cyaniding and Carbonitriding and their applications - Thermal methods - Flame hardening - induction hardening and their applications - Laser surface hardening - Diamond-like film coating - Surface hardness test - Vicker's hardness tester.

Total No of periods: 45

PH233 Applied Materials Science **3 0 0 3**

Text Books:

1. *Arumugam, M., " Materials Science ", Anuradha Publishers, 1997.*
2. *Raghavan, V., " Materials Science and Engineering ", Prentice Hall of India Pvt.Ltd., 1999.*

References:

1. *Muralidhara,M.K., " Materials Science and Processes ", Danpat Rai Publishing Co., 1998.*
2. *Nayak, S.P., " Engineering Metallurgy and Materials Science ", Character Publishing House, Anand, India, 1985.*
3. *Van Vlack, " Materials Science for Engineers ", Addison Wesley, 1985.*
4. *Anver, " Introduction to Physical Metallurgy ", McGraw Hill International Book Company, 1994.*
5. *Rajan, Sharma T.V. and Ashok Sharma, " Heat Treatment - Principles and Techniques ", Prentice Hall of India Pvt.Ltd., 1995.*
6. *Flinn R.A. & Trojan P.K., " Engineering Materials and their Applications ", M/s Jaico Publishing, 1998-1999.*

CE252 Strength of Materials Lab	**0**	**0**	**2**	**1**

. **30**

1. Tension test on a mild steel rod
2. Double shear test on mild steel and aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinell and Rockwell Hardness Number,
6. Deflection test on beams,
7. Compression test on helical springs.

Total No of periods: 30

Text Books:

1. Kazimi S.M.A., " Solid Mechanics ", First Revised Edition, Tata McGraw Hill Publishing Company Limited, NewDelhi, 1994.

ME238 Computer Graphics and Drafting **1 0 3 2**

1. GEOMETRY CREATION **2**

Creation of simple geometric bodies using basic primitives (line, arc, circle) and editing the drawing.

2. DRAWING STANDARDS **3**

Dimensioning and text writing - concept of layers (creation and setting) line types and forms.

3. ADVANCED CONCEPTS OF CAD SOFTWARE **5**

Creation of blocks, attributes for standard parts and inserting them in the drawing.

4. DRAFTING **5**

Preparation of 2-D drawings for machine components (bolts, nuts, flange coupling, connecting rod, cam profile) - 3-D modeling - solid, surface, wireframe using standard CAD packages - Assembly of standard parts created using 3-D model - creation of 2-D drawings from 3-D models using CAD packages, different views, sections, isometric view and dimensioning them - Parametric modelling, creating standard machine parts, connecting rod, flange coupling, bearings.

5. PRACTICAL **30**

Total No of periods: 45

ME238 Computer Graphics and Drafting **1 0 3 2**

References:

1. *" CAD and Solid Modeling Software Packages Auto CAD and Ideas Manuals of Latest Version ".*
2. *Asthana R.C.S. and Sinha N.K., " Computer Graphics - for Scientists and Engineers ", New Age International (P) Ltd., New Delhi, 1997.*
3. *Nagewara Rao P., " Auto Cad 14 for Engineers Drawing made by Easy ", Tata McGraw Hill Publishing Co., Ltd., 1999.*

ME331 Design of Machine Elements **3 0 0 3**

1. FUNADAMENTALS OF DESIGN **8**

Design Process - Computer aided design - Optimum design - Mechanical properties of materials - Types of loads - Stresses - Static , varying, thermal, impact and residue - Factors of safety - Theories of failure - Stress concentration factors - Introduction to fracture machines.

2. MECHANICAL SYSTEMS AND MANUFACTURES CONSIDERATIONS IN DESIGN **7**

Determination of power capacity - Torque levels - Efficiency of various transformation elements - Preferred numbers - Fits and tolerances - Surface finish - Standards.

3. DESIGN OF BASIC MACHINE ELEMENTS AND JOINTS **14**

Design of shafts, keys, coupling, journal bearings - Selection of rolling elements bearing - Design of pin, riveted and welded joints - Screw fasteners - Power screws.

4. DESIGN OF ENGINE PARTS **8**

Design of pistons - Connecting rod - Crank Shafts - Flywheels.

5. DESIGN OF SPRINGS **8**

Design of Helical springs - Compression and tension - Concentric springs - Belleville springs - Leaf springs - Rubber springs.

Total No of periods: 45

ME331 Design of Machine Elements **3 0 0 3**

Text Books:

1. S.G.Kulkarni, "Machine Design - Solved Problems", Tata McGraw Hill Publishing Company Ltd., 1998.

2. William Orthein,"Machine Component Design (Vol. I & II)", M/s. Jaico Publishing 1998-99.

References:

1. Joseph Edward Shigley and Charles R.Mischke, "Mechanical Engineering Design", McGraw Hill International Edition, 1989.

2. Gitin M.Maitra and LN Prasad, "Hand Book of Mechanical Design", Tata McGraw Hill, 1985.

3. V.B.Bhandari, "Design of Machine Elements", Tata McGraw Hill Publishing Company Ltd., 1998.

ME332 Measurements and Controls **3 0 0 3**

1. MEASUREMENTS **6**

General Concepts - Units and Standards - Measuring instruments - Sensitivity, readability, range of accuracy, precision - Static and dynamic response - Repeatability hystersis - Systematic and random errors - Correction calibration.

2. INSTRUMENTS **12**

Transducer, modifying (intermediate) and terminal stages - Mechanical and Electrical transducers - Preamplifiers-Charge amplifiers-Filters-Attenuators-D'arsonval-CRO-Oscillographs-Recorders-Microprocessor based data logging processing and output.

3. PARAMETER FOR MEASUREMENT **18**

Dimensions, displacement velocity, acceleration, impact - Force, torque, power-Strain - Pressure - Humidity - Temperature - Flow-Time, frequency and phase angle - Noise and sound level.
Radio tracer techniques-Flow visualization-Shadow graph interferometer, schileren, laser - Doppler - Anemometer.

4. AUTOMATIC CONTROL SYSTEMS **6**

Basic elements - Feedback principle, implication of measurements - Error detectors - Final actuating Elements - Two Position, multiposition, floating proportional controls - Relays - Servo amplifiers - Servo motors - Mechanical Electrical, magnetic, electronic, hydraulic, pneumatic systems.

5. APPLICATION OF CONTROL SYSTEMS **3**

Governing of speed - Kinetic and Process Control - Pressure, temperature, fluid level, flow - Thrust and flight control - Photoelectric controls.

Total No of periods: 45

ME332 Measurements and Controls **3 0 0 3**

Text Books:

1. T.G.Beckwith and N. Lewis Buck, " Mechanical Measurements ", Addison Wesley, 1961.

References:

1. J.P.Holman," Experimental Methods for Engineers ", McGraw Hill Book Company, 1971.
2. L.F.Adams, " Measurement and Instrumentation ", The English Language Book Society, 1975.
3. R.S.Sirhi and H.C.Radhakrishna," Mechanical Measurements ", Wiley Eastern Limited, 1983.
4. Pearson, Bric B," Technology of Instrumentation ", English University Press Ltd., 1957.
5. Donald P. Eckman," Industrial Instrumentation ", Wiley Eastern, 1985.

ME333 Gas Dynamics and Space Propulsion **3 1 0 4**

1. BASIC CONCEPTS AND ISENTROPIC FLOWS **6**

Energy and momentum equations of compressible fluid flows - Stagnation states, Mach waves and Mach cone - Effect of Mach number on compressibility - Isentropic flow through variable area ducts - Nozzle and Diffusers - Use of Gas tables.

2. FLOW THROUGH DUCTS **9**

Flow through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) - Variation of flow properties -Use of tables and charts -Generalised gas dynamics.

3. NORMAL AND OBLIQUE SHOCKS **10**

Governing equations - Variation of flow parameters across the normal and oblique shocks - Prandtl - Meyer relations - Use of table and charts - Applications.

4. JET PROPULSION **10**

Theory of jet propulsion - Thrust equation - Thrust power and propulsive efficiency - Operation principle,cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines - Aircraft combustors.

5. SPACE PROPULSION **10**

Types of rockets engines - Propellants - Ignition and combustion - Theory of rocket propulsion - Performance study - Staging - Thermal and characteristic velocity - Applications - Space flights.

Total No of periods: 45

ME333 Gas Dynamics and Space Propulsion **3 1 0 4**

Text Books:

1. S.M. Yahya, "Fundamentals of Compressible Flow", New Age International (P) Limited, New Delhi, 1996.

References:

1. P.Hill and C. Peterson, "Mechanics and Thermodynamics of Propulsion", Addison - Wesley Publishing Company, 1992.
2. N.J. Zucrow, "Aircraft and Missile Propulsion Vol. I & II", John Wiley , 1975.
3. N.J. Zucrow, "Principles of Jet Propulsion and Gas Turbines", John Wiley, New York, 1970.
4. H.Cohen, G.E.C.Rogers and Saravanamuttoo, "Gas Turbine Theory", Longman Group Ltd., 1980.
5. G.P.Sutton, "Rocket Propulsion Elements", John Wiley, 1986, New York.
6. A.H.Shapiro, "Dynamics and Thermodynamics of Compressible Fluid Flow Vol.", John Wiley , 1953, New York.
7. V.Ganesan, "Gas Turbines", Tata McGraw Hill Publishing Co., New Delhi, 1999.

ME334 Machine Tools **3 0 0 3**

1. TURNING MACHINES **8**

Lathe : Specification - Types - Mechanisms - Operations - Calculations - Capstan and turnet lathe - Tooling with examples - Copy turning lathe.

2. OTHER BASIC MACHINES **14**

Shaper : Specification - Types - Mechanism - Calculations

Planer : Specification - Types - Mechanism - Calculations

Drilling : Specification - Types -Feed Mechanism -Operations - Drill tool nomenclature - Mounting - Reamer and tap tools - Calculations.

Boraching : Specification - Types - Tool nomenclature - Broaching process.

Boring : Specification - Types - Operations - Boring tool - Jig Boring machine.

Grinding : Types of grinding machine - Designation and selection of grinding wheel - Bonds - Reconditioning of grinding wheel - Grinding of various machine elements - Lapping honing and super finishing.

3. GEAR CUTTING MACHINES **12**

Milling : Specification - Types - Cutter nomenclature - Types of cutter - Milling processes - Indexing - Cam and thread milling.

Kinematics of gear shaping and gear hobbing - Gear generation principles specifications - Cutters - Bevel gear generator - Gear finishing methods.

4. AUTOMATS **5**

Classification - Cam controlled automats, signal spindle and multi spindle automats - Swiss type, automatic screw mechanism - Feeding mechanism - Transfer mechanism, Tracer controller mechanism.

5. THEORY OF METAL CUTTING **9**

Mechanism of metal cutting - Cutting forces - Chip formation - Merchant's circle diagram - Calculations - Tool geometry - Machineability - Tool wear - Tool life - Cutting tool materials - Cutting fluids.

Total No of periods: 48

ME334 Machine Tools **3 0 0 3**

Text Books:

1. S.K. Hajra Choudry, S.K.Bose, "Workshop Technology Vol II".

2. P.C.Sharma, "A Text Books: of Production Engineering", S.Chand and Co. Ltd., IV Edition, 1993.

References:

1. De Garmo et al., "Materials and Processes in Manufacturing", Prentice Hall of India, Eight Edition, 1998.

2. Richara R. Kibbe, John E.Neely, Roland O. Meyer and Warrent T. White, "Machine Tool Practices", VI Edition, Prentice Hall of India, 1999.

3. N.K.Mehia, "Machine Tool Design and NC", Tata McGraw Hill Publishing Co. Ltd., 1999.

ME335 Computer Aided Design **2 0 2 3**

1. THE DESIGN PROCESS **4**

The design process steps - Morphology of design - Product cycle - Sequential and concurrent engineering - Role of computers - Computer Aided Engineering -Computer Aided Design - Design for Manufacturability - Computer Aided Manufacturing - Benefits of CAD.

2. INTERACTIVE COMPUTER GRAPHICS **10**

Creation of Graphics Primitives - Graphical input techniques - Display transformation in 2-D and 3-D - Viewing transformation - Clipping hidden line elimination - Mathematical formulation for graphics - Curve fitting techniques - Model storages and Data structure - Data structure organisation, creation of data files - Accessing data files - Concepts of data processing and information system. Data Bank Concepts - Data bank information storage and retrieval - Data life cycle - Integrated data processing - information system. Engineering Data Management System. Hierarchical data structure. Network data structure - Relational data structure. Data storage and search methods.

3. SOLID MODELING **3**

Geometric Modeling - Wireframe, Surface and Solid models - CSG and B-REP Techniques - Features of Soild Modeling Packages - Parametrics and features - Interfaces to drafting, Design Analysis.

4. FINITE ELEMENT ANALYSIS **13**

Introduction - Procedures - Element types - Nodal approximation - Element matrices, vectors and equations - Global connectivity - Assembly - Boundary conditions - Solution techniques - Interface to CAD - Introduction Packages - Software development for design of mechanical components.

Total No of periods: 30

ME335 Computer Aided Design **2 0 2 3**

Text Books:

1. Sadhu Singh, "Computer Aided Design and Manufacturing", Khanna Publishers, New Delhi, 1998.

References:

1. D.F. Rogers and J.A.Adams, "Mathematical Elements in Computer Graphics", McGraw Hill Book Company, New York, 1976.

2. P.Radhakrishnan and C.P.Kothandaraman, "Computer Graphics and Design", Dhanpat Rai and Sons, New Delhi, 1991.

3. E.Dieter George, "Engineering Design", McGraw Hill International Edition, 1991.

4. P.Radhakrishnan and S.Subramanyan, "CAD / CAM / CIM", Wiley Eastern Ltd., New Age International Ltd., 1994.

5. Groover and Zimmers, "CAD / CAM : Computer Aided Design and Manufacturing", Prentice Hall of India, New Delhi, 1994.

6. V.Ramamurthi, "Computer Aided Mechanical Design and Analysis", Tata McGraw Hill Publishing Co Ltd., 1998.

7. Ibrahim Zeid, "CAD-CAM Theory and Practice", Tata McGraw Hill Publishing Co Ltd., 1991

MF331 Engineering Metrology **2 0 2 3**

1. BASIC CONCEPTS OF MEASUREMENTS **5**

Need for measurement - Precision and Accuracy - Reliability - Errors in Measurements - Causes - Types.

2. LINEAR AND ANGULAR MEASUREMENTS **10**

Measurement of Engineering Components - Comparators, Slip gauges, Rollers, Limit gauges - Design and Applications - Auto collimator - Angle dekkor - Alignment telescope - Sine bar - Bevel protractors - Types - Principle - Applications.

3. FORM MEASUREMENTS **10**

Measurement of Screw thread and gears - Radius measurement - Surface finish measurement - Straightness. Flatness and roundness measurements - Principles - Application.

4. LASER METROLOGY **10**

Precision instrument based on Laser - Use of Lasers - Principles - Laser Interferometer - Application in Linear and Angular measurements - Testing of machine tools using Laser Interferometer.

5. ADVANCED IN METROLOGY **10**

Co-ordinate measuring machine - Constructional features - Types - Applications of CMM - CNC CMM applications - Computer Aided Inspection - Machine Vision - Applications in Metrology.

6. LABORATORY EXERCISE

i) Straightness measurment using Autocollimator.

ii) Measurment of Taper angle using Tool Makers Microscope.

iii) Measurment of various elements of screw thread using Tools Makers Microscope.

iv) Measurment of composite error using gear tester.

v) Calibration of optical comparator and measurment of dimension

vi) Determining the accuracy of electrical and optical comparator.

vii) Measurment of taper angle using sine bar.

viii) Measurment of various angles using Bevel Protractor.

ix) Measurment of dimensions using Vernier Height Gauge.

Total No of periods: 45

MF331 Engineering Metrology	**2**	**0**	**2**	**3**

Text Books:

1. R.K.Jain, "Engineering Metrology", Khanna Publishers, 1994.

References:

1. Gaylor, Shotbolt and Sharp, "Metrology for Engineers", O.R.Cassel, London, 1993.
2. Thomas, "Engineering Metrology", Butthinson & Co., 1984.
3. Books an Workshop Technology and Manufacturing Processes.

ME338 Computer Aided Manufacturing **3 0 0 3**

1. CAD / CAM INTERFACE **8**

Current trends in Manufacturing Engineering - Group Technology - Design for Manufacturing and Assembly - Process Planning Techniques - Total approach to product development - Concurrent Engineering - Rapid prototyping - Introduction to CAD/CAM software packages.

2. FUNDAMENTALS OF CNC MACHINES **10**

CNC Technology - Functions of CNC Control in Machine Tools - Classification of CNC systems - Contouring System - Interpolators open loop and closed loop CNC systems - CNC Controllers Hardware features - Direct Numerical Control (DNC Systems).

3. CONSTRUCTIONAL FEATURES OF CNC MACHINES **10**

Design consideration of CNC machines for improving machining accuracy-Structural members-Slideways-Sides linear bearings-Ball screws-Spindle drives and feed drives-work holding devices and tool holding devices-Automatic Tool charges. Feed Back devices-Principles of Operation-Machining Centres-Tooling for CNC machines.

4. PART PROGRAMMING FOR CNC MACHINES **9**

Numerical control codes-Standards-Manual Programming-Canned cycles and subroutines-Computer Assisted Programming CAD / CAM approach to NC part programming - APT language machining from 3D models.

5. PRODUCTION PLANNINF AND CONTROL **7**

Introduction to production planning and control-Shop Floor Control Systems-Just in time approach-Emerging Challenges in CAD / CAM Product Data Management-Product Modeling-Assembly and Tolerance Modeling-The World Wide Web environmentally begin production.

Total No of periods: 44

ME338 Computer Aided Manufacturing **3 0 0 3**

Text Books:

1. Ibrahim Zeid,"CAD-CAM Theory and Practice", Tata McGraw Hill Publishing Co. Ltd., 1998.

References:

1. Yoram Koren,"Computer Control of Manufacturing Systems", McGraw Hill Book Company, 1986.
2. MC Mahon and J. Browne, "CAD/CAM", Addison-Wesley, 1998.
3. P.Radhakrishnan, "Computer Numerical Control", New Central Book Agency, 1992.
4. G.T.Smith, "CNC - Machining, Techniques- Vol. 1, 2 & 3 ", verlag, 1992.
5. S.Kant Vajpayee, "Principles of Computer Integrated Manufacturing", Prentice Hall of India Ltd., 1999.

ME339 Design of Jigs, Fixtures and Press Tools **3 0 0 3**

1. LOCATING AND CLAMPING DEVICES **7**

Principles of Jigs and Fixtures design-Locating principles-Locating elements-Standard parts-Clamping devices-Mechanical actuation-Pneumatic & hydraulic actuation-Analysis of clamping forces-Tolerance and error analysis

2. JIGS **7**

Drill bushes-Different types of Jigs-Plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-Automatic drill jigs-Rack & Pinion Operated, Air operated Jigs Components.

3. FIXTURES **8**

General principles of boring, lathe, milling and broaching fixtures-Grinding, planning and shaping fixtures, Assembly, Inspection and Welding fixtures-Modular fixtures. Design and development of Jigs and fixtures for given components.

4. PRESS TOOLS **8**

Press working terminology-Presses and Press accessories-Computation of capacities and tonnage requirements-Strip layout-Design and development of various types of cutting, Forming and drawing dies-Blank development for Cylindrical and non cylindrical shells-Compound progressive, combination dies.

5. TERM PROJECT

Submission of an Industrial report on observation training in Jigs, Fixture and Press Tools.

Total No of periods: 30

ME339 Design of Jigs, Fixtures and Press Tools **3 0 0 3**

Text Books:

1. ASTME Hanbook of Fixture Design.

2. Design Data complied by the Faculty of Mechanical Engineering, P.S.G.Tech. Coimbatore.

References:

1. Fundamentals of Tool Design, ASTME, 1983.

2. A.K. Goroshkin, Jigs and Fixtures Handbook, Mix Publishers, Moscow, 1983.

3. Die Design Handbook, McGraw Hill Book Co., 1965.

4. P.Eugene Ostergaard, Basic Die Making - Mc Graw Hill Book, 1963.

ME340 Heat and Mass Transfer **3 1 0 4**

1. CONDUCTION **10**

Fourier law of conduction in simple and composite geometries, types of boundary and initial conditions, contact resistance, conduction with heat generation, extended surface heat transfer, transient and periodic heat conduction, application of numerical methods.

2. RADIATION **10**

Basic laws of radiation, radiation in ideal and real surfaces, view factor algebra, radiation shields, electrical analog using radiosity and irradiation, gaseous emission and absorption.

3. CONVECTIVE HEAT TRANSFER **10**

Dimensional analysis, boundary layer concept, basic governing equations, laminar and turbulent external and internal flows, forced and free convections, integral methods, semi-empirical correlations, flow over bank of tubes.

4. PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS **10**

Modes of boiling, Nusselt theory of condensation, correlations in boiling and condensation, types of heat exchangers, methods of analysis, fouling factor and simple design problems.

5. MASS TRANSFER **5**

Rate equations, mass diffusion in binary mixtures, evaporation in a column, forced convective mass transfer, heat and mass transfer analogies. Use of Standard Data Book is permitted in the examination

6. TUTORIALS **15**

Total No of periods: 60

ME340 Heat and Mass Transfer **3 1 0 4**

Text Books:

1. R.Yadav, "Heat and Mass Transfer", Central Publishing House, Allahabad, 1995.
2. R.C.Sachdeva, "Fundamentals of Engineering Heat and Mass Transfer", New Age International Publishers, New Delhi, 1995.

References:

1. Frank P. Incropera and David P. DeWitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons, 1998.
2. A.Bejan, "Heat Transfer", John Wiley and Sons, 1995.
3. M.N.Ozisik, "Heat Transfer", Mc Graw Hill Book Co., 1994.
4. C.P.Kothandaraman, "Fundamentals of Heat and Mass Transfer", New Age International Publishers, New Delhi, 1998.
5. James Sucec ,"Heat Transfer", M/s.Jaico Publishing 1998-99 Edition.
6. Nicholas P.C.,"Heat Transfer Hand Book", M/s Jaico Publishing 1998-99 Edition.

ME341 Hydraulics and Pneumatics Controls **3 0 0 3**

1. BASIC PRINCIPLES **10**

Hydraulic Principles - Hydraulic pumps - Characteristics - Pump Selection -Pumping Circuits -Hydraulic Actuators-Linear Rotary - Selection -Characteristics -Hydraulic Valves - Pressure - Flow - Direction Controls -Applications - Hydraulic Fluids-Symbols.

2. HYDRAULIC CIRCUITS **8**

Hydraulic circuits - Reciprocation - Quick return - Sequencing synchronizing -Accumulator circuits - Safety circuits - Industrial circuits - Press-Milling Machine - Planner-Fork Lift, etc.

3. DESIGN & SELECTION **8**

Design of Hydraulic circuits - Selection of components.

4. PNEUMATIC SYSTEMS **9**

Pneumatic fundamentals - Control Elements - Logic Circuits Position - Pressure Sensing - Switching - Electro Pneumatic - Electro Hydraulic Circuits - Robotic Circuits.

5. DESIGN & SELECTION **10**

Design of Pneumatic circuits - Classic-Cascade-Step counter - Combination -Methods - PLC-Microprocessors - Uses - Selection criteria for Pneumatic components - Installation and Maintenance of Hydraulic and Pneumatic power packs - Fault finding - Principles of Law Cost Automation - Case studies

Total No of periods: 45

ME341 Hydraulics and Pneumatics Controls **3 0 0 3**

Text Books:

1. J.Michael, Pinches and John G.Ashby, "Power Hydraulics", prentice Hall, 1989.

2. Andrew Parr,"Hydraulics and Pnematics (HB)", Jaico Publishing House, 1999.

References:

1. Dudleyt, A. Pease and John J. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.

2. Anthony Esposite,"Fluid Power with Applications", Prentice Hall, 1980.

ME342 Design of Transmission Systems **3 1 0 4**

1. DESIGN OF FLEXIBLE POWER TRANSMISSION SYSTEMS **10**

V belts and pulleys - Flat belts and pulleys - Wire ropes and pulleys - Link chains and pulleys - Transmission chains and Sprockets Silent chains - Ribbed V belts.

2. SPUR GEARS **8**

Force analysis -Tooth stresses - Dynamic effects - Estimating gear size - Fatigue strength - Factor of safety - Gear materials - Gear blank design.

3. HELICAL BEVEL AND WORM GEARS **10**

Parallel Helical Gears - Kinematics - Force analysis crossed helical gears - Worm Gearing - Force Analysis - Straight Bevel Gears - Kinematics Bevel Gear - Forces Analysis. Gear Blank Design.

4. DESIGN OF GEAR BOXES **7**

Geometric progression - Standard step ratio - Ray diagram kinematic layout -Design of sliding mesh gear box - Constant mesh gear box.

5. CLUTCHES, BRAKES **10**

Statics - Internal Expanding Rim Clutches and Brakes - External-Contracting Rim Clutches and Brakes Band -Type Clutches and Brakes. Frictional contact Axial clutches cone clutches and brakes - Energy Considerations. Temperature Rise -Friction Materials.

Total No of periods: 45

ME342 Design of Transmission Systems **3 1 0 4**

References:
1. Joseph Edward Shigley and Charles, R. Mischke,"Mechanical Engineering Design", McGraw Hill International Editions, 1989.
2. Gitin M.Maitra and L.V.Prasad, "Hand book of Mechanical Design", II Edition, Tata Mc Graw Hill, 1985.
3. V.B. Bhandari,"Design of Machine Elements", Tata McGraw Hill Publishing Company Ltd., 1994.
4. T.V.Sundarajamoorthy and N.Shanmugam, "Machine Design", Khanna Publishers, Delhi-6, 1989.

ME431 Total Quality Management **3 0 0 3**

1. PRINCIPLES OF QUALITY MANAGEMENT **8**

Definition of Quality - Deming, Miller, Crosby Theories - Services & Product quality - Customer orientation. Evaluation of Total Quality Management -Inspection - QC-TQM System - Human component.

2. QUALITY PLANNING **8**

Planning - SMART Goal setting- Designing for Quality - Manufacturing for Quality - Process control - Cpk - 6(- Process capability, Scientific Approach to TQM- Data based approach - Quantification - Statistical tools - Quality control tools- New 7 tools.

3. TQM TECHNIQUES **12**

Benchmarking-definition-Types-Steps-Metrics-Case studies. Quality Function Deployment-definition - Steps - Case studies - Corrective techniques - Preventive techniques - Failure Mode and Effect Analysis - 5S. Continuous improvement Techniques- different techniques such as POKA YOKE, etc. - Deming wheel - case studies.

4. HUMAN DIMENSION OF TQM **10**

TQM mindset-Leader, Manager of TQM- Qualities required for TQM-Participation Style - Teamwork - Team development - Motivational aspects - Change management.

5. SYSTEM COMPONENT OF TQM **7**

Documentation - Structure - Information system - ISO 9000 - QS9000 certification - clauses - procedures. TQM Road Map - Criteria - road map - evaluation.

Total No of periods: 45

ME431 Total Quality Management **3 0 0 3**

Text Books:

1. Joel E. Rose, Total Quality Management, II Edition, Kogan Page Ltd., USA, 1993.

2. Samuel K Ho, TQM - An Integrated Approach, II Edition, Kogan Page Ltd., USA, 1996.

References:

1. John Gilbert, Total Quality Management, Afiliated East West Press Pvt. Ltd. New Delhi, 1993

2. John Bank, Total Quality Management, Prentice Hall of India Pvt. Ltd., New Delhi, 1993.

ME432 Power Plant Engineering **3 0 0 3**

1. LAYOUT OF POWER PLANT **6**

Layouts of Steam, hydel, diesel, MHD, nuclear and gas turbine power plants - Combined power cycles - Comparison and selection

2. STEAM BOILER AND CYCLES **14**

Modern high pressure and supercritical boilers - Analysis of power plant cycles - modern trends in cycle improvement - Waste heat recovery, Fluidized bed boilers.

3. FUEL AND ASH HANDLING, COMBUSTION CHAMBER, DRAUGHT, AIR POLLUTION **10**

Preparation and handling of coal - Pulveriser - Dust collector - Ash removal; Stokers - Different types - Pulverised fuel burning ; Draught - Different types - Chimney design - Selection of blowers, Cooling towers - Different types - Analysis of pollution from thermal power plants - Pollution controls.

4. INSTRUMENTATION, TESTING OF BOILERS, POWER PLANT ECONOMICS **10**

CO2 recorders - Automatic controls for feedwater, steam, fuel,air supply and combustion, Boiler testing and trails - Inspection and safety regulations. Economics of power plant - Actual load curves, fixed costs - Operating costs - Variable lad operation.

5. NUCLEAR AND MHD POWER GENERATION **5**

Elementary treatment - Nuclear fission, chain reaction - Pressurised water reactors, boiling water reactors, gas cooled reactors - Fast breeder reactors, MHD power cycle principles.

Total No of periods: 45

ME432 Power Plant Engineering **3 0 0 3**

Text Books:

1. S.C. Arora and S. Domkundwar, "A Course in Power Plant Engineering", Dhanpat Rai and Sons, Tata McGraw Hill, 1998.
2. P.K.Nag, "Power Plant Engineering", Tata McGraw Hill Publishing Co. Ltd., 1998.
3. G.R. Nagpal, "Power Plant Engineerig", Khanna Publishers, 1998.

References:

1. Joel Weisman and Roy Eckart, "Modern Power Plant Engineering", Prentice Hall International Inc., 1985.
2. Bernhardt G. Askrotzki & William A. Vopat, "Power Station Engineering and Economy", Tata McGraw Hill Publishing Co. Ltd., 1972.
3. Frederick T. Mores, "Power Plant Engineering", Affiliated East-West Press Private Ltd., 1953.

ME433 Mechatronics **3 0 0 3**

1. INTRODUCTION **3**

Introduction to Mechantronics-Systems-Measurement Systems-Control Systems-Mechatronics Approach.

2. SENSORS AND TRANSDUCERS **12**

Introduction-Performance Terminology-Displacement, Position and Proximity-Velocity and Motion-Fluid Pressure-Temperature Sensors-Light Sensors-Selection of Sensors-Signal Processing.

3. 8055 MICROPROCESSOR **15**

Introduction-Architecture-Pin Configuration-Instruction set-Programming of Microprocessors using 8085 instructions-Interfacing input and output devices-Interfacing D/A converters and A/D converters-Applications-Temperature control-Stepper motor control-Traffic light controller.

4. PROGRAMMABLE LOGIC CONTROLLERS **8**

Introduction-Basic structure-Input/Output Processing-Programming-Mnemonics-Timers, Internal relays and counters-Data handling-Analog Input/Output-Selection of a PLC.

5. DESIGN AND MECHATRONICS **7**

Designing-Possible design solutions-Case studies of mechatronic systems.

Total No of periods: 45

ME433 Mechatronics **3 0 0 3**

Text Books:

1. W.Bolton, Mechatronics,Longman,Second Edition, 1999.

References:

1. Michael B. Histand and David G.Alciatore, "Introduction to Mechatronics and Measurement Systems", McGraw Hill International Editions, 1999.
2. HMT Ltd., "Mechatronics", Tata McGraw Hill Publishing Co. Ltd., 1998.
3. D.A.Bradley, D.Dawson, N.C.Buru and A.J.Loader, "Mechatronics", Chapman and Hall, 1993.
4. K.Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publications, Fourth Revised Edition, 1999.
5. Ramesh S. Gaonkar, "Microprocessor Architecture", Programming and Applications, Wiley Eastern, 1997.

MF441 Process Planning and Cost Estimation **3 0 0 3**

1. PROCESS PLANNING **9**

Types of Production - Standardization, Simplification - Production design and selection - Process planning, selection and analysis - Process planning, selection and analysis - Steps involved in manual experience based planning and computer aided process planning - Retrieval, generative - Selection of processes analysis - Breakeven analysis.

2. ESTIMATING AND COSTING **5**

Importance and aims of Cost estimation - Functions of estimation - Costing - Importance and aims of Costing - Difference between costing and estimation - Importance of realistic estimates - Estimation procedure.

3. ELEMENT OF COST **12**

Introduction - Material Cost - Determination of Material Cost Labour Cost - Determination of Direct Labour Cost - Expenses - Cost of Product (Ladder of cost) - Illustrative examples. Analysis of overhead expenses - Factory expenses - Depreciation - Causes of depreciation - Methods of depreciation - Administrative expenses - Selling and Distributing expenses - Allocation of overhead expenses.

4. PRODUCT COST ESTIMATION **10**

Estimation in forging shop - Losses in forging - Forging cost - Illustrative examples.
Estimation in welding shop - Gas cutting - Electric welding - illustrative examples.
Estimation in foundry shop - Estimation of pattern cost and casting cost - Illustrative examples.

5. ESTIMATION OF MACHINING TIME **9**

Estimation of machining time for Lathe operations - Estimation of machining time for drilling, boring, shaping, planning, milling and grinding operations - Illustrative examples.

Total No of periods: 45

MF441 Process Planning and Cost Estimation **3 0 0 3**

Text Books:

1. M.Adithan and B.S. Pabla, Estimating and Costing, Konark Publishers Pvt. Ltd., 1989.

2. A.K. Chitale and R.C. Gupta, Product Design and Manufacturing, Prentice Hall Pvt. Ltd., 1997.

References:

1. Nanua Singh, System approach to Computer Integrated Design and Manufacturing, John Wiley & Sons, Inc., 1996.

2. Joseph G. Monks, Operations Management, Theory & Problems, McGraw Hill Book Company, 1982.

3. G.B.S. Narang and V.Kumar, Production and Costing, Khanna Publishers, 1995.

4. T.R. Banga and S.C. Sharma, Estimating and Costing, Khanna Publishers, 1986.

ME435 Engineering Management **3 0 0 3**

1. ENGINEERING ECONOMICS **10**

Introduction - Demand and Revenue Analysis - Demand Forecasting - Production Analysis - Cost and Supply Analysis, Price and output Determination - Investment Analysis - Plant Location - Economic Optimization.

2. MANAGEMENT OF WORK **8**

Types of Business Organisation, Forms, Planning - Organising - Designing effective organisations - Coordination.

3. THE MANAGEMENT OF ENGINEERS **10**

Human Resource Development - Motivating individuals and workgroups - Leadership for Managerial Effectiveness - Team working and Creativity - Managerial Communication - Personal Management - Time Management - Stores Management - Career Planning.

4. THE MANAGEMENT OF ENGINEERING **10**

Financial Management - Product development - Management techniques in product development - Nature of controlling - Operations Management - Just-in-Time.

5. CONTEMPORARY MANAGEMENT ISSUES **7**

Managing World Economic Change - The global environment - Multinational Strategies - Economic Cycles and Director Investment - Change and Organisation Development - Managerial Ethics and Social responsibilities.

Total No of periods: 45

ME435 Engineering Management **3 0 0 3**

Text Books:

1. Gail Freeman - Bell and Janes Balkwill, Management in Engineering - Principles and Practive, Prentice Hall of India Pvt.Ltd., 1998.

2. Gene Burton and Manab Thaker, Management Today Principles and Practice, Tata McGraw Hill, 1995.

References:

1. M. Joesph, Putti Management - A Functional Approach, McGraw Hill, 1999.

2. R.R. Barathwal, Engineering Economics, McGraw Hill, 1997.

ME436 Operations Research **3 1 0 4**

1. LINEAR MODELS **15**

The phase of an operation research study- Linear programming - Graphical method - Simplex algorithm - Duality - Transportation problems - Assignment problems - Applications to problems with discrete variables.

2. NETWORKS **6**

Networks models - Shortest route - Minimal spanning tree - Maximum flow models - Project network - CPM and PERT networks - Critical path scheduling - Sequencing models.

3. INVENTORY MODELS **6**

Inventory models - Economic order quantity models - Quantity discount models - Stochastic Inventory models - Multi product models - Inventory control models in practice.

4. QUEUEING THEORY **6**

Queueing models - Queueing systems and structures - Notation parameter - Single Server and multi server models - Poisson input - Exponential service - Constant rate service - Infinite population - Simulation.

5. DECISION MODELS **10**

Decision models - Game theory - Two person zero sum games - Graphic solution - Algebric solution - Linear programming solution - Replacement models - Models based on service life - Economic life - Single/ Multi variable search technique - Application of OR models - Case studies.

6. TUTORIALS **15**

Total No of periods: 58

ME436 Operations Research **3 1 0 4**

Text Books:

1. H.A.Taha, Operations Research, Prentice Hall of India, 1999, Sixth Edition.

2. S.Bhaskar, Operations Research, Anuradha Publishers, Tamil Nadu, 1999.

Refrences:

1. Shennoy, Srivastava, Operation Research for Management, Wiley Eastern, 1994.

2. M.J. Bazara, Jarvis, H. Sherali, Linear Programming and Network Flows, John Wiley, 1990.

3. Philip and Ravindran, Operational Research, John Wiley, 1992.

4. Hillier and Lieberman, Operations Research, Holden Day, 1986.

5. Frank, S.Budnick, Dennis,McLeavy, Principles of Operation Research for Management, Richard D Irwin, 1990.

ME437 Automobile Engineering **3 0 0 3**

1. VEHICLE STRUCTURE AND ENGINES **10**

Vehicle construction, Chasis, Frame and Body, Engine types, Construction, Operation, Performance and Balance Engine Trouble Shooting, Gas Turbines, Air pollution Pollution standards.

2. ENGINE AUXILIARY SYSTEMS **10**

Carburetors, Electric Fuel Injection System - Monopoint and Multipoint Systems, Electrical Systems - Battery Generator, Starting Motor, Lighting and Ignition (Battery and Electronic Types)

3. TRANSMISSION SYSTEMS **10**

Clutch - Types and Construction, Fluid Flywheel, Gear Boxes, Manual and Automatic - Overdrives - Propeller Shaft - Differential and Rear Axle.

4. RUNNING SYSTEMS **8**

Wheel and Tyres, Steering Geometry and Types, Types of front axle, Suspension systems, Braking systems.

5. ALTERNATIVE FUELS/ POWER PLANTS **7**

Use of Hydrogen, Natural Gas LPG and Hydrogen in Automobiles as fuels, Electric and Hybrid vehicles, Fuel cells

Total No of periods: 45

ME437 Automobile Engineering **3 0 0 3**

Text Books:

1. R.B. Gupta, Automobile Engineering, Satya Prakashan, 1993.

References:

1. William Crouse, Automobile Engineering Series, McGraw Hill, 1988.
2. Newton and Steeds, Motor Vehicles, ELBS, 1985
3. Duffy Smith, Auto Fuel Systems, The Good Heat Willcox Company Inc., 1987
4. Osamu Hirao and Richard K. Pefley, Present and Future Automotive Fuels, John Wiley and Sons, 1988.

GE034 Creativity, Innovation and New Product Development 2 0 2 3

1. INTRODUCTION 8

The process of technological innovation - factors contributing to successful technological innovation - the need for creativity and innovation - creativity and problem solving - brain storming - different techniques.

2. PROJECT SELECTION AND EVALUATION 8

Collection of ideas and purpose of project - Selection criteria - screening ideas for new products (evaluation techniques).

2. PROJECT SELECTION AND EVALUATION 9

3. NEW PRODUCT DEVELOPMENT 7

Research and new product development - Patents - Patent search - Patent laws - International code for patents - Intellectual property rights (IPR).

4. NEW PRODUCT PALNNING 7

4. NEW PRODUCT PLANNING 7

Design of proto type - testing - quality standards - marketing research - introducing new products.

5. LABORATORY 30

Creative design - Model Preparation - Testing - Cost evaluation - Patent application.

5. LABORATORY

Total No of periods: 76

GE034 Creativity, Innovation and New Product Development 2 0 2 3

References:
1. HARRY NYSTROM, " Creativity and innovation", John Wiley & Sons, 1979.
2. BRAIN TWISS, "Managing technological innovation", Pitman Publishing Ltd., 1992.
3. HARRY B.WATTON, "New Product Planning", Prentice Hall Inc., 1992.

GE034 Creativity, Innovation and New Product Development 2 0 2 3

1. INTRODUCTION 8

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4. NEW PRODUCT PALNNING 7

4. NEW PRODUCT PLANNING 7

Design of proto type - testing - quality standards - marketing research - introducing new products.

5. LABORATORY 30

Creative design - Model Preparation - Testing - Cost evaluation - Patent application.

5. LABORATORY

Total No of periods: 76

GE034 Creativity, Innovation and New Product Development	**2**	**0**	**2**	**3**

Text
Refrence

HS035 Technical German I **3 1 0 4**

1. INTRODUCTION **5**

Special and comparative features of German with English, Hindi and Tamil - German Alphabets, pronunciation.

2. THEMA **10**

Name, Land Wohnort - Sudium, Beruf - Familie, Geschwister, Alter - Tagesablauf , termine - Einladung - Stellensuche, Berufswahl - Einkauf.

3. GRAMMATIK **10**

Personalpronomen, Verb, Wortstellung, Ort - Possessivpronomen, Verb - 'Sein' - Verb - 'Haben', Unbestimmter Artikel, Negation - 'Nicht' - 'Kein ' - Zeit, Bestimmter Artikel, Starke Verben - Trennbare Verben, Imperativ - Modal Verben - Akkusativ.

4. UEBUNGEN **10**

Partner urbungen - Sachriftliche Uebungen - Aussprache Uebungen - Kontrollue bungen - Text generation.

5. DIALOGUE **5**

Oral - Written.

6. GLOSSARY **5**

Technical Words.

Total No of periods: 45

HS035 Technical German I	**3**	**1**	**0**	**4**

Text Books:
LERNZIEL DEUTSCH (Deutsch als Fremdsprache) - Grundstufe 1 from Max Hueber varlag.

HS036 Technical German II **3 1 0 4**

1. INTRODUCTION **5**

German Idioms and Phrases.

2. THEMA **10**

Geschenke, auf der post - Auskunft - Fest - Heirat, Kinder - Studium - Ausbuilding - Erziehung, Jugend - Deutschsprachige Laender, Europa - Arbeitswelt, Urlaub.

3. GRAMMATIK **10**

Ort and Richtung - Reflexive Verben, Verben mit Praepositional object - Perfect - Praeteritum - Adjective - Komparation, Genitic Wortbuildung - Nebensaetze.

4. UEBUNGEN **10**

Partner uebungen - Schriftliche Uebungen - Aussprache Uebungen - Kontrolluebungen - Text Generation.

5. DIALOGUE **5**

Oral - Written.

6. GLOSSARY **5**

Technical Words.

7. TUTORIALS **15**

Total No of periods: 60

HS036 Technical German II	**3**	**1**	**0**	**4**

Text Books:
LERNZIEL DEUTSCH (Deutsch als Fremdsprache) - Grundstufe 1 from MAX Hueber Verlag.

HS037 Technical Japanese I **3 1 0 4**

1. **9**

Introduction to Japanese Alphabets - Hiragana, Katakana and Kanji - group 1,2,3 & 4 Syllabus - Writing Practice - Pronunciation - word Order - Greetings - Receiving a visitor and exchange of pleasantries - Kanji Practice.

2. **9**

Basic structure of sentences - classification of verbs - Polite form of verbs - irregular verbs - Particle-E - Time expressions - question sentences - Japanese numerals - Kanji practice.

3. **9**

Classification of particles - Ga, Ka, Wa, O, E, Ni etc - aural comprehension - reading comprehension - noun -1 Wa, noun -2 desu - Demostrative pronouns - kore, sore , are and dore - kono, sono, ano and dono - kochira - sochira - achira and dochira - parcle - No, kara, ni and de - question - itsu - conversational grammar - soo desu ka - Na, I adjectives perfect and imperfect - question words - Doo and ikaga - particle - To, ne and yo - Kanji practice.

4. **9**

Desu as a substitute for a verb - demonstrative pronouns sono and sore - Group 1 particles - de, O, Made and Ka - conjunction - soshite - Question words - dare, nani, doko, itsu, dore, dochira,doyatte, ikutsu, ikura - Words for degrees - gurai or kurai - Phrase - Saa - anoo - numerals - counters and numbers - humble form of desu and arimasu - Kanji practice.

5. **9**

Verbs ending in-te or de - classification of Te forms and Masu forms - verb modifiers - koo,soo, aa and doo - Set phrase - Onegaishimasu - Sumimasen - Adverbs - Mazu,sore kara and saigo ni - formation of the Te form of I adjective and desu - kanji practice.

Total No of periods: 45

HS037 Technical Japanese I **3 1 0 4**

Text Books:

1. OOTSUBO et al - A Course in Modern Japanese , Vol.1, 1983, The University of Nagoya Press, Japan.

2. SHIYO SUZUKI and IKUO KAWASE - Nihongo Shoho text book with audio tapes, 1981.

3. YAN - SAN Serial - Video tapes, Japan.

HS038 Technical Japanese II **3 1 0 4**

1. **9**

Demonstrative Pronouns: Are - Interjection: Ee - Quoted Sentences - omoimsu - Non polite form of verbs - Group 1 ending in -ert or iru, group 2 verbs ending in - u - Non polite forms of - I - adjectives -non polite form of desu,deshoo,daroo - Suffic - Sugiru - expression of reason - tame (ni) - Counters: - Hon and - Do - Kanji practice.

2. **9**

Negative - Te - form of verbs -I adjectives - Permission and prohibition - te mo desuka and - te wa ikemasen ka - Na - adjectives - suki and kirai - Verbs:Itadaku - Conjunction - Nagara - Phrase - No koto na n desu ga - usage of chotto - kanji practice.

3. **9**

Noun modifiers - Quoting modifier - Suffix - Kata - sa and me - Particles - Made ni and dake - te form of verb and iru/imasu - noun - Uchi - Eba form of verbs - Kanji practice.

4. **9**

Potential sentences - group 1 verbs - group 2 verbs irregular verbs - Nouns - Tsumori and Hazu - Adverbs: Moo and Made - Form of address: moshomoshi - Expression - Ee - verbs: Naru and suru - Particles - De and ka - kanji practice.

5. **9**

Comparative sentences - no hoo ga and yori - Negative comparative sentences - Negative request - Adverbs of extent - Konna ni, sonna ni and anna ni - Te form of transitive verb and - arul - Passive sentence - neutral passive sentence - technical vocabulary related to Engineering and Technology - Preparation of technical reports.

6. **TUTORIALS** **15**

Total No of periods: 60

HS038 Technical Japanese II **3 1 0 4**

Text Books:

1. OOTSUBO ET AL - A Course in Modern Japanese, Vol.II, The University of Nagoya Press, Japan, 1983.

2. SHIYO SUZUKI and IKUO KAWASE - Nihongo Shoho text book with audio tapes, The Japan Foundation, Tokyo, Japan, 1981.

3. YAN -SAN Serial - Video tapes, Japan.

HS039 Technical French I **3 1 0 4**

1. **9**

Alphabets - Pronunciation - Masculine and Feminine Genders only - Numbers - Indefinite and definite articles - plurals - Verbs to be and to have.

2. **9**

Present tense - Affirmative, interrogative and negative sentences - Adjectives - Adverbs - Prepositions - Possessive Pronoun - Personnel Pronoun - Indirect Object.

3. **9**

Group I verbs - Conjugations - Present, Past compound, Simple past and future tenses - Singular & Plural - Masculine and Feminine - adjectives and adverbs.

4. **9**

Group II Verbs - Conjugations- Present, Past compound, simple past and future tenses - Singular and Plural - Masculine and Feminine - adjectives and adverbs.

5. **9**

Pronomial verbs - Presnet, Past compound, Simple past and future tenses - Singular and Plural - Masculine and Feminine - adjectives - adverbs - Dialogue - Glossary.

Total No of periods: 45

HS039 Technical French I **3 1 0 4**

Text Books:
1. MAUGER. G - Course de Langue et de - Civilization Francaises, HACHETTE -PARIS, 1986.
2. DOMINIQUE BERGER and REGINE MIRIEUX, Cadences, Method de Francais Didier, Paris, 1994.

References:
DENIS GIRARD, French to English, English to French Dictionary, Cassell - Mac Millan, 1981.

HS040 Technical French II **3 1 0 4**

1. **9**

Group III Verbs - Conjugations - Adjectives - Adverbs - sentences - present - past compound - Simple past - future.

2. **9**

Comparative, superlative sentences - recent past - immediate future - grammatical analysis.

3. **9**

Translation from English to French - Translation from French to English - Texts from Physics and Chemistry.

4. **9**

Translation from English to French - Translation from French to English - Texts from Basic Engineering.

5. **9**

Report writing and translation from English to French - Translation from French to English - Letter Writing - Dialogue - Glossary.

6. TUTORIALS **15**

Total No of periods: 60

HS040 Technical French II **3 1 0 4**

Text Books:

1. MAUGER, G - Cours de Langue et de - Civilization Francaises, HACHETTE - PARIS, 1986.

2. DOMINIQUE BERGER and REGINE MIRIEUX, Cadences Methods de Francais, Didier, Paris, 1994.

References:

1. CENTRE D'ETUDES FRANCAISES, Functional French for Scientists and Technologists, Jawaharlal Nehru University, New Delhi, 1986.

2. J.O.KETTRIDGE. Dictionary of Technical terms and phrases Vol 1 & 2., The Gresham Press, Surrey, Great Britain, 1980.

HS041 English I **3 1 0 4**

1. LISTENING **7**

Listening comprehension-listening for specific information-note-taking-use of charts and diagrams.

2. SPEAKING **7**

Defining-describing objects-describing uses/functions-comparing-offering suggestions-analysing problems and providing solutions-expressing opinions (agreement/disagreement) predicting-expressing possibility/certainty-framing questions-providing answers-pronunciation practice (word stress).

3. READING **12**

Skimming-scanning-detailed reading-predicting content-interpreting charts and tables-identifying stylistic features in texts - evaluating texts-understanding discourse coherence-guessing meaning from the context- note -making / transferring information.

4. WRITING **12**

Sentence definition-static description-comparison and contrast-classification of information-recommendations-highlighting problems and providing solutions-formal and informal letter writing-using flow-charts/diagrams-paragraph writing-editing.

5. FOCUS ON LANGUAGE **7**

Word formation with prefixes and suffixes-discourse markers and their functions-degrees of comparison-expressions relating to recommendations and comparisons-active and passive voice-antonyms-tense forms-gerunds-conditional sentences-modal verbs of probability and improbability-acronyms and abbreviations - compound nouns and adjectives-spelling-punctuation.

6. PRACTICE IN LANGUAGE LAB **15**

Pronunciation practice - word stress - sentence stress - Listening comprehension - discussion - interpretation of visuals.

Total No of periods: 60

HS041 English I **3 1 0 4**

Text Books:

1. *"English for Engineers and Technologists", Volume I. Authors : Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd., 1990.*

References:

1. *Narayanaswami, V.R.Strengthen Your Writing, Orient Longman Ltd., Chennai 1996 (Revised Edition)*
2. *Pickett and Laster, Technical English, Writing, Reading and Speaking, New York Harper and Row Publications.*
3. *Swan, Michael, Basic English Usage, Oxford University Press, 1984.*

HS042 English II **3 1 0 4**

1. LISTENING **7**

Listening comprehension - listening for specific information - note-taking and using non-verbal devices.

2. SPEAKING **7**

Describing processes-stating purpose-offering opinions, suggestions and recommendations-summarizing-reporting-free discussion of chosen topics-pronunciation practice (word stress, consonant clusters-homonyms)

3. READING **12**

Skimming-scanning-note -making-understanding the organisation of texts discourse cohesion-predicting and evaluating content-evaluating style-inferring meaning-study reading-interpreting tables, flow-charts.

4. WRITING **12**

Extended definition-process description-cause and effect analysis-stating choice and justifying it -safety instructions-check list-letter of application-data sheet/resume.

5. FOCUS ON LANGUAGE **7**

Word formation-synonyms-prepositions-adverbs-passive voice-sequence words/discourse markers-connective adverbs-numerical expressions-expansion of abbreviations-rules for writing SI units-language of instructions, check-lists, causes and effects, purpose and means-indefinite adjectives of number and quantity-spelling and punctuation.

6. TUTORIAL **15**

Total No of periods: 60

HS042 English II **3 1 0 4**

Text Books:

1. *"English for Engineers and Technologists", Volume II, AUTHORS :Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd.,1990.*

References:

1. *Swales, John.M. and Christine B Feak,"Academic Writing for graduates students", The University of Michigan Press, USA, 1994.*
2. *Goddard, Ken - Informative Writing - Your Practical Guide to Effective Communication,.Cassell Publication U.K. 1998.*
3. *Cutts, Martin. The Plain English guide-How to write clearly and Communicate Better, Oxford University Press, New Delhi, 1995.*

ME034 Refrigeration and Air conditioning **3 0 0 3**

1. REFRIGERATION CYCLES & REFRIGERANTS **9**

Vapour Compression Refrigeration Cycle-Simple saturated vapour compression Refrigration cycle. Thremodynamic analysis of the above. Refrigerant Classification, Designation, Alternate Refrigerants, Global Warming Potential & Ozone Depleting Potential aspects

2. SYSTEM COMPONENTS **9**

Refrigerant Compressors - Reciprocating Open & Hermetic type, Screw Compressors and Scroll Compressors - Construction and Operation characteristics. Evaporators - DX coil, Flooded type Chillers Expansion devices - Automatic Expansion Valves, Capillary Tuber & Thermostatic Expansion Valves. Condensing Units and Cooling Towers.

3. CYCLING CONTROLS AND SYSTEM BALANCING **9**

Pressure and Temperature controls. Range and Differential settings. Selection and balancing of system components Graphical method.

4. PSYCHROMETRY **9**

Moist air behaviour, Psychrometric chart, Different Psychrometric process analysis.

5. AIR CONDITIONING **9**

Summer and Winter Airconditioning, Cooling Load Calculations, Air Distribution Patterns, Dynamic and Frictional Losses in Air Ducts, Equal Friction Method, Fan Characteristics in Duct Systems.

Total No of periods: 45

ME034 Refrigeration and Air conditioning **3 0 0 3**

Text

1. W.F.Stocker and J.W.Jones, " Refrigeration & Air Conditioning " McGraw Hill Book Company, 1985.

Refrence

1. R.J.Dossat, " Principles of Refrigeration ", John Wiley and Sons Inc., 1989.

2. Manohar Prasad, " Refrigeration and Air Conditioning " Wiley Eastern Ltd., 1995.

ME035 Design of Heat Exchangers **3 0 0 3**

1. CONSTRUCTION DETAILS AND HEAT TRANSFER **9**

Types, Shell and Tube Heat Exchangers, Regenerators and Recuperators, Industrial applications Temperature distribution and its implications, LMTD, Effectiveness.

2. FLOW DISTRIBUTION AND STRESS ANALYSIS **9**

Effect of Turbulence, Friction factor, Pressure Loss, Channel divergence. Thermal Stress in tubes, Types of failures.

3. DESIGN ASPECTS **9**

Heat Transfer and pressure loss, Flow Configuration, Effect of Baffles, effect of Deviations from ideality, Design of Typical liquid, Gas-Gas-Liquid Heat Exchangers, Plate Heat Exchangers.

4. CONDENSORS AND EVAPORATORS DESIGN **9**

Design of Surface and Evaporative Condensors, Design of Shell and Tube, Plate type evaporators.

5. COOLING TOWERS **9**

Packings, Spray design, Selection of pumps, Fans and Pipes, Testing and Maintenance, Experimental Methods.

Total No of periods: 45

ME035 Design of Heat Exchangers **3 0 0 3**

Text

1. D.Q>Kern, " Process Heat Transfer ", Tata McGraw Hill, Edition, New Delhi, 1997.

Refrence

1. Arthur P.Frass, " Heat Exchanger Design ", Second Edition, John Wiley & Sons, New York, 1996.

2. T.Taborek, G.F.Hewitt and N.Afgan " Heat Exchangers ", Theory and Pratice, McGraw Hill Book Co., 1980.

3. Walker, " Industrial Heat Exchangers " - A Basic Guide, McGraw Hill Book Co., 1980.

4. Nicholas Cheremisioff, " Cooling Tower ", Ann Arber Science pub., 1981.

5. Holger Martin, " Heat Exchangers ", Hemisphere Publishing Corporation, London, 1992.

ME036 Cryogenic Engineering **3 0 0 3**

1. CONSTRUCTION DETAILS AND HEAT TRANSFER **9**

Interoduction to Cryogenic Systems Low Temprature properties of Engineering Materials. Cryogenic fluids and their properties. Applications in space, Food Processing, super Conductivity, Electrical Power, Bioligyedicine, Electronics and Cutting Tool Industry.

2. LIQUEFACTION AND LOW TEMPERATURE REFRIGERATION **9**

Liquefaction systems ideal system; Joule Thomson expansion, Adiabatic expansion, Linde Hampson A Cysle, Claude & Cascaded System, Magnetic Cooling, Stirling Cycle Cryo Coolers.

3. SEPRATION AND PURIFICATION SYSTEMS **9**

General charateristics of mixtures-composition diagrams. Gas sepration-principles of rectification-flash calculations - Rectification column analysis, Flash calculations.

4. INSULATION AND VACUUM TECHNOLOGY **9**

Thermal insulation and their performance at cryogenic temperatures, Super Insulations, Vacuum insulation, Powder insulation, Cryopumping Applications.

5. STORAGE AND INSTRUMENTATION **9**

Cryogenic Storage vessels and Transportation, Transfer devices. Pressure flow-level and temperature measurements.

Total No of periods: 45

ME036 Cryogenic Engineering **3 0 0 3**

Text

1. Klaus D.Timmerhaus and Thomas M.Flynn, " Cryogenic Process Engineering " Plenum Press, New York, 1989.

Refrence

1. Randal F.Barron, " Cryogenic Systems ", McGraw Hill, 1986.

2. R.B.Scoott, " Cryogenic engineering ", Van Nostrand Company Inc., 1985.

3. J.H.Bell, " Cryogenic Engineering ", Prentice Hall Inc., 1963.

ME037 Wind and Solar Power Engineering **3 0 0 3**

1. PRINCIPLE OF SOLAR RADIATION **9**

Solar Radiation - Empirical Equations - Solar Chart-Measuremnets of Solar Radiation and Sunshine - Solar Radiation Data.

2. SOLAR THERMAL ENERGY CONVERSION **9**

Solar Thermal Collectors - Flat Plate and Concentrating Collectors - Solar Heating and Cooling Techniques - Solar Desalination - Solar Pond - Industrial Process Heat - Solar Thermal Power Plant - Solar Thermal Energy Storage.

3. SOLAR PHOTO VOLTAICS **9**

Introduction-Fundamentals Estimation-Wind Energy Conversion Systems-wind Energy Collectors and its Performance-Wind Energy Storage-Applications of Wind Energy-Safety and Environmental Aspects.

4. WIND ENERGY **9**

Wind Data Energy Estimation - Wind Energy Conversion Systems - Wind Energy Collectors and its Performance - Wind Energy Storage - Applications of Wind Energy - Safety and Environmental Aspects.

5. ECONOMIC ANALYSIS **9**

Introduction - Net present value concept - Life cycle cost method - Cost benefit comparison method - Payback method

Total No of periods: 45

ME037 Wind and Solar Power Engineering **3 0 0 3**

Text

1. WS.P. Suknofme, " Solar Energy Principle of Thermal Collection and Storage " (1997), Tata Mc Graw Hill Publishing Company ltd., New Delhi.
2. G.D.Rai, " Non Conventional Energy Sources " (1999), Khanna Publishers, New Delhi.

Refrence

1. H.P.Garg and J.Prakash, " Solar Energy, Fundamentals and Applications " (1997), Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. B.S.Magal, " Solar Power Engineering " (1993), Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. J.R.Howell, R.B.Bannerot and G.C.Vtiet, " Solar Thermal Systems ", (1982), Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
4. J.A.Duffie and W.A.Beckman, " Solar Engineering of Thermal Process " (1991), John Wiley, New York.
5. Golding E.W. " The Generation of Electricity "' by Wind Power (1976), E and F N Spon Ltd., London.
6. Le Gourieres D., " Wind Power Plant, Theory and Design ", (1982), Pergamon Press, France.

ME038 Energy Engineering and Management **3 0 0 3**

1. ENERGY AND ENVIRONMENT **9**

Introduction - Fossil fuels reserves-World energy consumption - Green house effect, Global warming-Renewable energy sources - Environmental aspects utilization - Energy prizes - Energy policies.

2. ENERGY CONSERVATION **9**

Energy conservation schemes - Industrial energy use - Energy surveying and auditing - Energy index - Energy cost - Cost index - Energy conservation in engineering and process industry, in thermal systems, in buildings and non-conventional energy resources schemes.

3. ENERGY TECHNOLOGIES **9**

Fuels and consumption - Biolers - Furnaces - Waste heat recovery systems - Heat pumps and refrigerators - Storage systems - Insulated pipe work systems - heat exchangers.

4. ENERGY MANAGEMENT **9**

Energy management principles - energy resource management - Energy management information systems - Instrumentation and measurment - Computerized energy management

5. ECONOMIC AND FINANCE **9**

Costing techniques - Cost optimization - Optimal target investment schedule - Financial appraisal and profitability-Project management.

Total No of periods: 45

ME038 Energy Engineering and Management **3 0 0 3**

Text

1. W.R. Murphy and G.Mc KAY "Energy Management" Butterworths, London.

Refrence

1. O.Callaghn. P.W. "Design and Management for Energy Conservation", (1981) Pergamon Press, Oxford.
2. David Merick, Richard marshal, "Energy, present and future options, Vol. I and II", (1981) John Wiley and Sons.
3. Chaigier N.A. "Energy Consumption and Environment", (1981), McGraw Hill.
4. Ikken P.A. Swart R.J and Zwerves.S, "Climate and Energy", (1989).
5. Ray D.A. "industrial Energy Conservation", (1980) Pergamaon Press.

ME039 Nuclear Engineering **3 0 0 3**

1. NUCLEAR PHYSICS **9**

Nuclear model of the atom - Equivalence of mass and energy - Binding - Radio activity - Half life - Neutron interactions - Cross sections.

2. NUCLEAR REACTIONS AND REACTOR MATERIALS **9**

Mechanism of nuclear fission and fusion - Radio activity - Chain reactions - Critical mass and composition - Nuclear fuel cycles and its characteristics - Uranium production and purification - Zirconium, thorium, beryllium.

3. REPROCESSING **9**

Nuclear fuel cycles - spent fuel characteristics - Role of solvent extraction in reprocessing - Solvent extraction equipment.

4. NUCLEAR REACTIONS **9**

Reactors - Types of fast breeding reactors - Design and construction of fast breeding reactors - heat transfer techniques in nuclear reactors - reactor shielding.

5. SAFTEY, DISPOSAL AND PROFILERATION **9**

Nuclear plant safety- Safety systems - Changes and consequences of an accident - Criteria for safety - Nuclear waste - Type of waste and its disposal - Radiation hazards and their prevention - Weapons proliferation.

Total No of periods: 45

ME039 Nuclear Engineering **3 0 0 3**

Text

1. Thomas J.Cannoly, " Fundamentals of Nuclear Engineering ", John Wiley (1978).

Refrence

1. Collier J.G., and G.F.Hewitt, " Introduction to Nuclear Power " (1987), Hemisphere Publishing, New York.

2. Lamarsh U.R. " Introduction to Nuclear Engineering Second Edition " (1983), Addison Wesley M.A.

3. Lipschutz R.D. " Radioactive Waste - Politics, Technology and Risk " (1980), Ballingor, Cambrifge. M.A.

ME040 Environmental Pollution **3 0 0 3**

1. INTRODUCTION **9**

Environmental aspects - Impact of environment - Environmental quality - Role of environmental engineer.

2. AIR POLLUTANTAS **9**

Air quantity - Definition, Characteristics and prospective - Types of our air pollutants - effect to air pollution on men and environment- Formation of air pollutanta from combustion of fossil fuels and parameters controlling the formation.

3. WATER POLLUTANTS **9**

Water pollution from tanneries and other industries - Engineered systems for waste water treatment and disposal Control systems and instrumentation for pollution control.

4. SOLID WASTE **9**

Definition, characteristics-Types and sources of solid waste - Solid waste management - generation, collection, storage and processing techniques - Solid waste disposal.

5. INDUSTRAIL POLLUTION **9**

Methods and equipment's for industrial waste treatment- Pollution thermal power plants and nuclear power plants - Sources and control methods - Emission from SI and Ci engines-Evaporative emission control - Exhaust treatment devices- Noise pollution and their control.

Total No of periods: 45

ME040 Environmental Pollution **3 0 0 3**

Text

1. Howard S. Peavy, Donald R.Rowe, and George Tchnobanoglous, " Environmental Engineering ", (1985), Mc Graw Hill, New Delhi.

Refrence

1. A.C.Stern, H.C.Wonter, R.W. Boubce and W.P.Lowry ": Fundamental of Air Pollution " (1973), Academic Press.

2. Ikken P.A. Swart R.J. and Zwerves.S. " Climate and Energy ", (1989). Mc Graw Hill, New Delhi.

3. Metcalf and Eddy Inc, " Waste Water Engineering Treatment and Disposal Second Edition ", (1979), Mc Graw Hill, New York.

4. Wark, Kenneth and Cecil F.Warner, " Air Pollution: its Origin and Control ". (1976) Dun Dunnellers, New York.

5. Tchobanoglous.G, H.Theisan and R.Elaisen, " Solid Water: Engineering Principles and Management Issues ", (1977), Mc Graw Hill, New York.

ME041 Waste Heat Recovery and Co-generation **3 0 0 3**

1. INTRODUCTION **9**

Source and utilization of waste heat, thermodynamic analysis-Second law and waste heat, Recovery of waste heat engines and other power plants-Heat pump for waste heat recovery.

2. DESIGN OF WASTE HEAT RECOVERY SYSTEM **9**

Design of waste heat recovery system - Heat exchanger - Theory and design. Organic fluid systems - Analysis and design.

3. COGENERATION PRINCIPLES **9**

Cogeneration principles and thermodynamics power cycle analysis, combined for power generation and process heat.

4. APPLICATIONS OF COGENERATION **9**

Applications in sugar mills rice mills, texitle factories, and other process and engineering industries.

5. COST ANALYSIS OF GENERATION SYSTEMS **9**

Financial considerations, operating and maintenance cost, invetment costs of waste heat recovery and cogeneration system, environmental and air quality consideration.

Total No of periods: 45

ME041 Waste Heat Recovery and Co-generation **3 0 0 3**

Text

1. Charles H.Butler, "Cogeneration", (1984) Mc Graw Hill Book Co.
2. Goldstick R., et.al., "Principles of Waste Heat Recovery", (1986) The Fairment Press, Inc., Georgia.

Refrence

1. Kiang Y.H., "Waste Utilization Technology", (1981) Maecel Dekker Inc.
2. David Hu and Gerald Hrd, "Waste recycling for Energy Conservation", (1981) John Wiley and Sons, New York.
3. Sydney Reiter, "Industrial and Commercial Heat Recovery Systems", (1985), Van Nostrand Reinhold.
4. Spiewak Scott A, "Cogeneration and Small Power Production Manual", (1987) The Fairment Press.
5. Nelson E, Hay, "Guide to Natural Gas Cogeneration", (1980) The Fairment Press Inc.

ME042 Turbo Machinery **3 0 0 3**

1. PRINCIPLES **9**

Energy transfer between fluid and rotor, classification of fluid machinery, dimensionless parameters, specific speed, applications, stage velocity triangles, work and efficiency for compressors and turbines.

2. CENTRIFUGAL FANS AND BLOWERS **9**

Types, stage and design parameters, flow analysis in impeller blades, volute and diffusers, losses, characteristics curves and selection, fan drives and fan noise.

3. CENTRIFUGAL COMPRESSOR **9**

Construction details, types, impeller flow losses, slip factor, diffuser analysis, lossess and performance curves.

4. AXIAL FLOW COMPRESSOR **9**

Stage velocity triangles, enthalphy-entropy diagrams, stage losses and efficiency, workdone factor, simple stage design problems and performance characteristics.

5. AXIAL AND RADIAL FLOW TURBINES **9**

Stage velocity diagrams, reaction stages, losses and coefficients blade design principles, testing and performance characteristics.

Total No of periods: 45

ME042 Turbo Machinery **3 0 0 3**

Theory

1. Yahya, S.H., Turbines, Compressor and Fans, Tata Mc Graw Hill Publishing Company, 1996.

Refrence

1. Bruneck, Fans, Pergamom Press, 1973.
2. Earl Logan, Jr., Hand book of Turbomachinery, Marcel Dekker Inc., 1992.
3. Dixon, S.I.,. Fluid Mechanics and Thermodynamics of Turbomachinery, Pergamom Press, 1990.
4. Shepherd, D.G., Principles of Turbomachinery, Macmillan, 1969.
5. Stepanff, A.J., Blowers and Pumps, John Wiley and Sons Inc., 1965
6. Ganesan .V., Gas Turbines, Tata Mcgraw Hill Pub.Co., New Delhi, 1999.

ME043 Advanced IC Engineering **3 0 0 3**

1. SPARK IGNITION ENGINES **9**

Spark ignition Engine mixture requirements - Feedback Control Carburettors-Fuel - Injection systems - Monopoint and Multipoint injection - Stages of combustion - Normal and Multipoint injection - Stages of combustion - Normal and Abnormal combustion- Factors affecting knock-Combustion chambers - Introduction to Thermodynamic Analysis of S.I.engine Combustion.

2. COMPRESSION IGNITION ENGINES **9**

States of combustion in C.I.Engine - Direct and indirect injection systems - Combustion chambers - Fuel spray behaviour - spray structure, spray penetration and evaporation - Air motion - Turbocharging - Introduction to Thermodynamic Analysis of C.I.Engine combustion.

3. POLLUTANT FORMATION CONTROL **9**

Pollutant - Sources and types-formation of NOx - Hydro-carbon Emission Mechanism-Carbon Monoxide Formation-Particulate emissions-Methods of controlling Emissions- Catalytic converters and Particulate Traps-Methods of measurements and Driving cycles.

4. ALTERNATIVE FUELS **9**

Alcohal, Hydrogen, Natural Gas and Liquified Petroleum Gas-Properties, Suitability, Engine Modifications, Merits and Demerits as fuels.

5. RECENT TRENDS **9**

Learn Burn Engines-Stratified charge Engines- Gasoline Direct Injection Engine - Homogeneous charge compression Ignition - Plasma Ignition - Measurement techniques.

Total No of periods: 45

ME043 Advanced IC Engineering **3 0 0 3**

Text

1. John B. Heywood, Internal Combustion Engine Fundamentals, McGraw Hill, 1988.

Refrence

1. R.B.Mathur and R.P.Sharmal, Internal Combustion Engines

2. Rowland S.Benson and N.D.Whitehouse, Internal combustion Engines, Vol.I and II, Pergamon Press, 1983.

3. Duffy Smith, Auto fuel Systems, The Good Heart Willox Company, Inc., 1987.

ME044 Special Casting Processes **3 0 0 3**

1. INTRODUCTION **9**

Introduction to stand casting - Conventional mould and Core making - Need for special casting process - applications.

2. SHELL MOULDING **9**

Process - Machines - Pattern - Sand, resin and other materials - Process parameters charateristics of shell mould castings - 'D' Process - Applications.

3. INVESTMENT CASTING **9**

Process - Pattern and mould materials - Block mould and ceramic shell mould - Mercast and shaw process - Application.

4. CENTRIFUGAL AND DIECASTING **9**

Types of Cetrifugal processes - calculation of rotating speed of the mould - Equipment - Application.

5. CONTINOUS CASTING CO2 SAND PROCESS AND FULL MOULD PROCESSES **9**

Reciprocating continous mould process - Direct chill process - Use of steel, aluminium, brass material in continuous casting

Co2 mould/core hardening process - principles Full mould process - APPLICATIONS

Other special process like squeeze casting and electro slag casting processes.

Total No of periods: 45

ME044 Special Casting Processes	**3**	**0**	**0**	**3**

Text
1. Foundry technology, P.L.Jain, 1992.
Refrence
1. Engineering Metallurgy, Vol.II, R.A. Higgins, 1994.

ME045 Industrial Robotics **3 0 0 3**

1. INTRODUCTION **9**

Definition of a Robot - Basic Concepts - Robot configurations - Types of Robot drives - Basic robot motions - Point to point control - Continuous path control.

2. COMPONENTS AND OPERATIONS **9**

Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators - director and inverse kinematics, Coordinate transformation - Brief Robot dynamics. Types of Robot and effectors - Grippers - Tools as end effectors - Robot/End - effort interface.

3. SENSING AND MACHINE VISION **9**

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis.

4. ROBOT PROGRAMMING **9**

methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - A1 and Robotics.

5. INDUSTRIAL APPLICATIONS **9**

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments.

Total No of periods: 45

ME045 Industrial Robotics **3 0 0 3**

Text

1. K.S. Fu., R.C.Gonalez, C.S.G.Lee, Robotics Control sensing, Vision and Intelligence, McGraw Hill International Edition, 1987.

Refrence

1. Mikell P. Groover, mitchell Weiss, Industrial robotics, technology, Programming and Applications, McGraw Hill International Editions, 1986.

2. Richard D. Klafter, Thomas A. Chmielewski and Michael Negin "Robotic engineering - An Integrated Approach", Prentice Hall Inc, Englewoods Cliffs, NJ, USA, 1989.

ME046 Finite Element Techniques **3 0 0 3**

1. INTRODUCTION - VARIATIONAL FORMULATION **8**

General field problems in Engineering - Modelling - Discrete and Continuous models - Characteristics - Difficulties involved in solution - The relevance and place of finite element method - Historical comments - Basic concept of FEM. Boundary and initial value problems - Gradient and divergence theorems - Functionals - Variational calculus - Variational formulation of VBPS. The method of weighted residuals - The Ritz method.

2. FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS **8**

One dimensional second order equations - discretisation of domain into elements - Generalised coordinates approach - derivation of elements equations - assembly of element equations - imposition of boundary conditions - solution of equations - Cholesky method - Post processing - Extension of the method to fourth order equations and their soultions - time dependent problems and their soultions - example from heat transfer, fluid and solid mechanics.

3. FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS **8**

Second order equations involving a scalar-valued function - model equation - Variational formulation - Finite element formulation through generalised coordinates approach - Triangular elements and quadrilateral elements - convergence criteria for chosen models - Interpolation functions - Elements matrices and vectors - Assembly of element matrices - boundary conditions - solution techniques.

4. ISOPARAMETRIC ELEMENTS AND FORMULATION **7**

Natural coordinates in 1,2 and 3 dimensions - use of area coordinates for triangular elements in - 2 dimensional problems - Isoparametric elements in 1,2 and 3 dimensions - Largrangean and serendipity elements - Formulation of element equations in one and two dimensions - Numerical integration.

5. APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONS **7**

Equations of elasticity- plane elasticity problems - axisymmetric problems in elasticity -Bending of elastic plates - Time dependent problems in elasticity - Heat - transfer in two dimensions - incompressible fluid flow.

6. INTRODUCTION TO ADVANCED TOPICS **7**

Three dimensional problems - Mixed formulation - use of software packages.

Total No of periods: 45

ME046 Finite Element Techniques **3 0 0 3**

Text

1. J.N.Reddy, An Introduction to Finite Element Method, McGraw Hill, Intl. Student Edition, 1985.

Refrence

1. Rienkiewics, The finite element method, Basic formulation and linear problems, Vol.1, 4/e, McGraw Hill, Book Co.

2. S.S.Rao, The Finite Element Method in Engineering Pergaman Press, 1989.

3. C.S.Desai and J.F.Abel, Introduction to the Finite Element Method, Affiliated East west Press, 1972.

ME047 Experimental Stress Analysis **3 0 0 3**

1. STRESS **9**

Stress at a point - Stress equations of Equilibrium - Laws of stress transformation - Principal stresses - Maximum Shear stress - Dimensional state of stress.

2. STRAIN MEASUREMENT **9**

Strain - its relation to experimental determination - properties of strain Gauge systems - Electrical resistance strain gauges - strain gauge circuits - recording instruments - analysis of strain gauge data.

3. MOIRE METHODS **9**

Mechanism of formation of Moire fringe - geometrical approach to Moire fringe analysis - displacement field approach to Moire fringe analysis - out of plane measurements experimental procedure.

4. PHOTOELASTICITY METHODS **9**

Temperature double refraction - stress optic law - effects of stressed model in a plane polariscope fringe multiplication - isochromatic fringe patterns - isoclinic fringe pattern compensation techniques - calibration methods - separation methods - scaling model to phototype stresses - materials.

5. BIREFRIGENT COATINGS **9**

Coating stresses and strains - sensitivity - materials and applications - effect of thickness - stress sepration.

Total No of periods: 45

ME047 Experimental Stress Analysis **3 0 0 3**

Text

1. Dove Adams, Experimental Stress Analysis, McGraw Hill, 1992.

Refrence

1. James Dalley, W.F.Riley, Experimental mechanics, int. Student Edition McGraw Hill, Kogakusha Ltd., 1992.

2. Perry and Lissiener, Strain Gauge Primer, McGraw Hill, 1965.

3. Durelli, Photomechanics Prentice Hall, 1972.

ME048 Mechanical Vibrations **3 0 0 3**

1. INTRODUCTION **9**

relevance of and need for vibration analysis-Mathematical modelling of vibrating systems - Discretes and continous systems - review of single-degree of freedom systems-free and forced vibrations, Various damping models.

2. TWO DEGREE-OF-FREEDOM SYSTEMS **9**

Genral solution to free vibration problem-damped free vibration - Forced vibration of undamped system - dynamic vibration absorbes - Technical applications.

3. MULTI DEGREE-OF-FREEDOM SYSTEMS **9**

Free and forced vibrations of multi-degree of freedom systems in longitudinal torsional and lateral modes-Matrix methods of solution-normal modes - Orthogonality principle-Energy methods, Introduction to vibrations of plates.

4. CONTINUOUS SYSTEMS **9**

Torsional vibrations - Longitudinal vibration of rods - transverse vibrations of beams - Governing equations of motion-Natural frequencies and normal modes - Energy methods, Introduction to vibration of plates.

5. VIBRATION MEASUREMENT **9**

Vibration monitoring-data acquistion-Vibration Parameter Selection-Vibration sensors-Accelerometers-Performance charateristics-Sensor location-Signal preamplification-Types of preamplifiers-Instrumentation-Tape recorders-Real time analysis-Digital Fourier transforms-FFT Analysis- Signature analysis and preventive maintanence: Vibration meters-vibration signatures-standards-vibration testing equipment-in-site balancing of rotors.

Total No of periods: 45

ME048 Mechanical Vibrations **3 0 0 3**

Text

1. J.S.Rao and K.Gupta, Introductory Course on Theory and practice of Mechanical Vibrations, Wiley Eastern Ltd., 1991.

Refrence

1. P.Srinivasan, Mechanical Vibration Analysis, Tata-Mc Graw Hill, New Delhi, 1982.
2. G.K.Grover, Mechanical Vibrations, New Chand and Bros., Roorkey,1989.
3. Seto, Mechanical Vibrations, Schaum Series, McGraw Hill Book Co.,
4. J.P.Den Hartog, Mechanical Vibrations (4th Edition) McGraw Hill, New York,1985.
5. L.Meirovitch, Elements of vibration Analysis (2nd Edition) McGraw Hill, New York, 1985.

ME049 Industrial Tribology **3 0 0 3**

1. SURFACES AND FRICTION **9**

Topography of Engineering surfaces- Contact between surfaces - Sources of sliding Friction - Adhesion Ploughint- Energy dissipation mechanisms Friction Characteristics of metals - Friction of non metals. Friction of lamellar solids - friction of Ceramic materials and polymers - Rolling Friction - Source of Rolling Friction - Stick slip motion - Measurement of Friction.

2. WEAR **9**

Types of wear - Simple theory of Sliding Wear Mechanism of sliding wear of metals-Abrasive wear - Materials for Adhesive and Abrasive wear situations - Corrosive wear - Surface Fatigue wear situations - Corrosive wear - Surface Fatigue wear - Brittle Fracture wear- Wear of Ceramics and Polymers - Wear Measurements.

3. LUBRICANTS AND LUBRICATION TYPES **9**

Types and properties of Lubricants - Testing methods - Hydrodynamic Lubrication - Elasto hydrodynamic lubricatation- Boundary Lubrication - Solid Lubrication Hydrostatic Lubrication.

4. FILM LUBRICATION THEORY **9**

Fluid film in simple shear - Viscous flow between very close parallel plates - Shear strress variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings - Reaction torque on the bearings - Virtual Co-efficient of friction - The Somerfield diagram.

5. SURFACE ENGINEERING AND MATERIALS FOR BEARINGS **9**

Surface modifications - Transformation Hardening, surface fusion - Thermo chemical processes - Surface coatings - plating and anodizing - Fusion Processes - Vapour Phase processes - Materials for rolling Element bearings - Materials for fluid film bearings - Materials for marginally lubricated and dry bearings.

Total No of periods: 45

ME049 Industrial Tribology **3 0 0 3**

Text

1. I.M. Hutchings, Tribology, Friction and Wear of Engineering Material, Edward Arnold, London, 1992.

Refrence

1. T.A. Stolarski, Tribology in Machine Design, Industrial Press Inc., 1990.

2. E.P.Bowden and Tabor.D., Friction and Lubrication, Heinemann Educational Books Ltd., 1974.

3. A.Cameron, Basic Lubrication theory, Longman, U.K.., 1981.

4. M.J.Neale (Editor), Tribology Handbook, Newnes. Butter worth, Heinemann, U.K., 1975.

ME050 Design of Manufacture **3 0 0 3**

1. DFMN APPROACH AND PROCESS **9**

Methodologies and tools, design axioms, design for assembly and evaluation, minimum part assessment taquchi method, robustness assessment, manufacturing process rules, designer's tool kit, Computer Aided group process rules, designer's tool kit, Computer Aided group Technology, failure mode effective analysis, Value Analysis.

Design for minimum number of parts, development of modular design, minimising part variations, design of parts to be multi-functional, multi-use, ease of fabrication, Poka Yoka principles.

2. GEOMETRIC ANALYSIS **9**

Process capability, feature tolerance, geometric tolerance, surface finish, review of relationship between attainable tolerence grades and difference machining processes. Analysis of tapers, screw threads, applying probability to tolerences.

3. FORM DESIGN OF CASTINGS AND WELDMENTS **9**

Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols.

4. MECHANICAL ASSEMBLY **9**

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

5. TRUE POSITION THEORY **9**

Virtual size concept, floating and fixed fasterners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, examples. Operation sequence for typical shaft type of components. Prepration of process drawings for different operations, tolerence worksheets and centrality analysis, examples.

Total No of periods: 45

ME050 Design of Manufacture **3 0 0 3**

Text

1. Harry Peck, "Designing for Manufacture:, Pitman Publications, 1983.
2. Matousek, "Engineering Design, - A Systematic Approach" - Blackie & Son Ltd., London, 1974.

Refrence

1. Sports M.F.., "Dimensioning and Tolerence for Quantity Production, Prentice Hall Inc., 1983.
2. Oliver R. Wade, "Tolerence Control in Design and Manufacturing", Industrial Press Inc. New York Publications, 1967
3. James G. Bralla, "Hand Book of Product Design for Manufacturing" McGraw Hill Publications, 1983.
4. Trucks H.E., "Design for Economic Production", Society of Manufacturing Engineers, michigan, 2nd edition, 1987.

ME051 Design of Pressure Vessels and Piping **3 0 0 3**

1. INTRODUCTION **9**

Methods for determining stresses - Terminology and Ligament Efficiency - Applications.

2. STRESSES IN PRESSURE VESSELS **9**

Introduction - Stresses in a circular ring, cyclinder - Membrane stress Analysis of Vessel Shell components - Cylindrical shells, spherical sheels, torispherical heads, conical heads - Thermal stresses - Discontinuity stresses in pressure vessels.

3. DESIGN OF VESSELS **9**

Design of tall cyclindrical self supporting process columns - supports for short vertical vessels - stress concentration - at a variable thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of reinforcement - pressure vessel design.

4. BUCKLING AND FRACTURE ANALYSIS IN VESSELS **9**

Bucking phenomenon - Elastic Bucking of circular ring and cylinders under external pressure - collapse of thick walled cylinders or tubes under external pressure - effect of supports on Elastic Bucking of cylinders - Bucking under combined External pressure and axial loading - Control and significance of Fracture Mechanics in Vessels - FEM apllication.

5. PIPING **9**

Introduction - Flow diagram - Piping layout and piping stress Analysis.

Total No of periods: 45

ME051 Design of Pressure Vessels and Piping **3 0 0 3**

Text

1. John F. Harvey, Theory and Design of Pressure Vessels, CBS Publishers and Distributors, 1987.

Refrence

1. Henry H. Bedner, "Pressure Vessels, Design Hand Book, CBS Publishers and Distributors, 1987.

2. Stanley, M. Wales, "Chemical Process Equipment, Selection and Design. Buterworths series in Chemical Engineering, 1988.

ME052 Composite Materials Technology **3 0 0 3**

1. INTRODUCTION **9**

Limitations of conventional materials - definition of composite materials - types and characteristics - applications.

2. MATERIALS **9**

Fibbers - Materials - Fibber reinforced plastics - thermoset polymers - Coupling agents, filters and additives - Metal Matrix and Ceramic composites.

3. MANUFACTURING **9**

Fundamentals - bag moulding - compression moulding pultrusion-filament winding - other manufacturing process - quality inspection and non-destructive testing.

4. MECHANICS AND PERFORMANCE

Introduction to micro-mechanics-unidirectional lamina - laminates - interlaminar stresses - static mechanical properties - fatigue properties - impact properties - enviromental effects - fracture mechanics and toughening mechanisms, damage prediction, failure modes.

5. DESIGN **9**

Failure predictions - design considerations - joint design - codes - design examples. Optimization of laminated composites - Application of FEM for design and analysis of laminated composites.

Total No of periods: 36

ME052 Composite Materials Technology **3 0 0 3**

Text

1. Ronald Gibson, Principles of Composite Material Mechanics, Tata McGraw Hill, 1994.
2. Micael hyer, Stress Analysis of Fiber - Reinforced Composite Materials, Tata McGraw Hill, 1998.

Refrence

1. P.K.Mallicak, Fiber-reinforced composites, Monal Deklar Inc., New York, 1988.
2. B.D. Agarwal and L.J.Broutman, Analysis and Performance of Fiber Composites, John Wiley and Sons, New York, 1980.
3. F.L.Matthews & R.D.Rawlings, Composite Materials, Engineering and Sciences, Chapman & hall, London, 1994.

ME053 Mechanics of Fracture **3 0 0 3**

1. INTRODUCTION **9**

Crack in a structure - Graffils Crterion cleavage fracture Ductile fracture fatigue cracking service failure analysis.

2. ELASTIC CRACK **9**

Elastic Crack tip stress field - Solution to Crack problems Effect of finite size stress intensity factor - Special cases - Irwin plastic zone correction- Actual shape of plastic zone - Plane stress - Plane strain.

3. ENERGY PRINCIPLE **9**

Energy release rate - Criterion for crack growth - Crack resistance curve - Principles of crack arrest - Crack arrest in Practice.

4. FATIGUE CRACK GROWTH **9**

Fatigue crack growth test, stress intensity factor, factors affecting stress intensity factor - variable amplitude service loading, retardation model.

5. ELASTIC PLASTIC FRACTURE MECHANICS **9**

Elastic plastic fracture concept - crack tip opening displacement - J using FEM.

6. APPLICATION OF FRACTURE MECHANICS **9**

Fracture design - selection of materials - fatigue crack growth rate curve - stress intensity factor range - use of crack growth law.

Total No of periods: 54

ME053 Mechanics of Fracture **3 0 0 3**

Text

1. John M. Barson and Stanely T. Rolfe Fracture and Fatigue Control in Structure - Prentice Hall, Inc, USA, 1987.

Refrence

1. David Broek - Elementary engineering Fracture Mechanics Sifthoff and Noordhoff Internal Publishers, 1978.

2. Jean Lemative and Jean Louis Chboche Mechanics of Solid Materials, Cambridge University Press, Cambridge, 1987.

ME054 Unconventional Machining Processes **3 0 0 3**

1. INTRODUCTION **8**

The need of the process-classification - Energies employed in the processes-EDM,EC,USM,LBM,PAM,AJM,WJM etc.

2. ELECTRICAL DISCHARGE MACHINING **8**

Process, operating principles-Breakdown mechanism-Dielectric fluid-Electrode material-Tool wear - Power generator circuits- Process parameters - Metal removal rate - wire out EDM - Appliocations - Recent Developments in EDM.

3. ELECTRO CHEMICAL MACHINING **8**

Process-principles-Equipment-Analysis of metal removal-tool material-Insulation-Process parameters-ECH,ECG etc. - Applications.

4. ELECTRON BEAM, LASER BEAM AND PLASMA ARC MACHINING **7**

EBM Process, Principle-gun construction - Types of gun - Vacuum and non-vacuum technique-Applications.
LBM Process, principles, pumping processes, emission types-beam control-applications.

5. ULTRASONIC MACHINING **7**

Process-working principles-types of transducers-concentrators-nodal point clamping-feed mechanism-metal removal rate-Process parameters-Apllications.

6. ABRASIVE JET AND WATER JET MEASURING **7**

AJM Processes-Principle-Equipment-Metal removal rate process parameters-Applications.
WJM Process-Principle-Equipment-Applications.

Total No of periods: 45

ME054 Unconventional Machining Processes **3 0 0 3**

Text

1. Non Conventional Machining, P.K.Mishra, The Institution of Engineers (India) Text Books: Series, 1997.

Refrence

1. A Text Books: of Production Engineering, P.C.Sharma, 1995.

ME055 Combustion Engineering **3 0 0 3**

1. COMBUSTION OF FUELS **9**

Combustion equations, Theoretical air, excess air, air fuel ratio, equivalence ratio, exhaust gas composition, Air-fuel ratio from exhaust gas composition, heating value of fuels.

2. THERMODYNAMICS OF COMBUSTION **9**

Thermo-chemistry, First law analysis of reacting systems, Adiabatic combustion temperature, Second law analysis of reacting systems, criterion for chemical equilibrim, Equilibrim constant for gaseous mixtures, Evaluation of equilibrium composition, chemical availability.

3. KINETICS OF COMBUSTION **9**

Rates of reaction, Reaction order and molecularity complex reactions, chain reactions, Arrhenius rate equation, Collection theory, activated complex theory, Explosive and general oxidative characteristics of fueled.

4. FLAMES **9**

Laminar and Turbulent flames, Premixed and Diffusion flames, Burning velocity and its determination, Factors affecting burning velocity, Quenching, Flammability and Ignition, Flame stabilization in open burners.

5. ENGINE COMBUSTION **9**

Combustion in SI and CI engines, stages of combustion in SI and CI engines, Normal combustion and Abnormal combustion, Emissions from premixed combustion, Emission from Nonpremixed combustion, Control of emissions

Total No of periods: 45

ME055 Combustion Engineering **3 0 0 3**

Text

1. Stephen R.Turns, 'An Introduction to Combustion', McGraw Hill Book Company, 1996.

Refrence

1. Irwin Glassman, "Combustion", Third Edition, Academic Press, 1996.
2. S.P. Sharma and Chandramohan, 'Fuels and Combustion', Tata McGraw Hill Book Co., 1984.
3. Samir Sarkar, 'Fuels and Combustion', Orient Longman, 1984.
4. K.K.Kuo, 'Principles of Combustion', John Wiley & Sons, 1984.
5. J.B. Heywood, 'Internal Combustion Engine Fundamentals', Mc Graw Hill Book Co., 1988.

ME056 Entrepreneurship Development **3 0 0 3**

1. ENTREPRENEURSHIP **9**

Entrepreneur - Traits of Entrepreneurs - Types of Entrepreneurs - Intrepreneur Diffenernce between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth, Factors affecting Entrepreneurical Growth.

2. MOTIVATION **9**

Major motives influencing Entrepreneur- Achivement Motivation Training, Self Rating, Business game, Thematic Apperception Test - Stress Management. Entrepreneurship Development Programs - Need, objectives.

3. BUSINESS **9**

Small Enterprises-definition, Classification - Characteristics, ownership structure-Project Formulation - Steps involved in setting up a Business - Identifying, Selecting a good business opportunity Market survey and Research, Techno economic Feasibility Assessment - Preliminary Project Report-Project Appraisal-Sources of information-Classification of needs and Agencies.

4. FINANCING & ACCOUNTING **9**

Need-Sources of Finance, Term Loans, Capital structure, Financial Institutions, Management of working capital, Costing Break Even Analysis, Network analysis Techniques of PERT/CPM - Taxation - Income Tax, Excise Duty - Sales Tax.

5. SUPPORT TO ENTREPRENEURS **9**

Institutioinal Support to Entrepreneurs-Sickness in small Business - Concept, Magnitude, Causes and Consequences, Corrective measures - Government Policy for small Scale Enterprise - Growth strategies in small Industry - Expansion, Diversification, Joint venture, Merger, sub-contracting.

Total No of periods: 45

ME056 Entrepreneurship Development **3 0 0 3**

Text

1. S.S. Khanka, Entrepreneurial Development, S.Chand & Co. Ltd, Ram Nagar , New Delhi, 1999.

Refrence

1. EDII-Faculty & External experts - A Hand Book for new Entrepreneurs.

publishers : Entrepreneurship Development, Institute of India, Ahmedabad, 1986.

ME057 Technology Management **3 0 0 3**

1. INTRODUCTION **8**

Introduction to technology Management - Environment of Business - Technological changes - Productivity Management - Cultural Impact on Management & Technology - Japanese Management Practices.

2. MANAGING WORLD ECONOMIC CHANGE **8**

Concepts for Managing change - The global environment - Domestic sources of multi national behaviour- Multi national strategies - Economic cycles and Direct Investment.

3. ENTREPRENEURSHIP, CREATIVITY & ORGANISATION **7**

Managing creativity - A perspective on Entrepreneurship creating Effective work groups-understanding self and other people at work -Stress Strain Management - time Management -Strategic management-Innovation Management.

4. INFORMATION TECHNOLOGY IN BUSINESS **7**

Technical foundation - Building information systems - Management organisational support system-Managing Information Systems.

5. MATERIALS MANAGEMENT **7**

Micro and Macro Level - Systems Approach-materials-Planing-ABC Analysis -SQC-Incoming material control- Kaizan and 5's - International Buying and Import purchasing practice and procedures-Just in time. Maintenance measurement.

6. PORTFOLIO MANAGEMENT **7**

Introduction to securities-Risk and return-Economic analysis-Industry analysis-Technical analysis-Portfolio selection-Managing portfolio and performance measurement.

Total No of periods: 44

ME057 Technology Management **3 0 0 3**

Text

1. Kenneth C.Lauden, 'MIS Organisation & Technology', Prentice hall, 1995.

2. James A Senn, Information Technology in Business, Prentice hall, 1995.

3. Joseph M. Putti, Management - A Functional Approach, Mc Graw Hill, 1997.

Refrence

1. Ronald J.Jordan, Security analysis and Portfolio Management, Prentice Hall, 1995.

2. Irvin M.Robin, Organisational Behaviour - An Experimental Approach, prentice Hall, 1995.

3. A.K.Datta, Materials Management, Prentice Hall, 1998.

ME058 Marketing Management **3 0 0 3**

1. BASICS **9**

Definition, Marketing Process, Dynamics, Needs, Wants & Demands, Marketing Concepts, Environment, mix, types, philosophies, Selling Vs. Marketing, organisation, Industrial Vs. Consumer Marketing, Consumer goods, Industrial goods, Product hierarcy.

2. BUYING BEHAVIOUR & MARKET SEGMENTATION **9**

Cultural, Demographic factors, Motives, types, Buying decisions, segmentation factors, Demographic, Psychographic & Geographic Segmentation, Process, Patterns.

3. PRODUCT PRICING & MARKETING RESEARCH **9**

Objectives, pricing, Decisions and Pricing methods, Pricing Management. Introduction, Uses, process of Marketing Research.

4. MARKETING PLANNING & STRATEGY FORMULATION **9**

Components of a marketing plan, strategy formulations and the marketing process, implementation, Portfolio analysis, BCG, GEC grids.

5. ADVERTISING, SALES PROMOTION & DISTRIBUTION **9**

Characteristics, Impact, goals, types, Sales promotion-Point of Purchase, Unique Selling proposition. Characteristics, Wholesaling, Retailing, channel design, logistics, Modern Trends in retailing.

Total No of periods: 45

ME058 Marketing Management **3 0 0 3**

Text

1. Govindarajan.M. 'Modern Marketing Management', Narosa Publishing House, New Delhi, 1999.

Refrence

1. Philip Kolter, 'Marketing Management: Analysis, Planning, Implementation and Control', 1998.

2. Green Paul.E. and Donald Tull, 'Research for Marketing Decisions', 1975.

3. Ramaswamy.V.S. and S.Namakumari, 'Marketing Environment: Planning, Implementation and Control the Indian Context', 1990

4. Jean Plerre Jannet Hubert D Hennessey Global Marketing Strategies.

ME059 Information Technology **3 0 0 3**

1. INTRODUCTION **9**

Data-Information-Knowledge-Concepts of Database Design and Architecture-Commercial and Engineering Database.

2. COMPUTER HARDWARE AND SOFTWARE **9**

Mother Board-Memory Devices-Bus-Ports and Peripherals-i/o Devices-PC and Work stations- Foundations of Operating System and its level of Abstraction-Compilers-Interrupt Services-Applications Software - Elements of Visual Programming - Concepts, Components and formats of Multimedia-Principles of Virtual Reality.

3. SOFTWARE ENGINEERING AND QUALITY CONTROL **9**

Introduction-Principles and Requirements-Planning-Cost Estimation-Design Concepts-Modularisation-Notation-Implementation-Verification-Manintenance-Software quality management, ISO and CMM.

4. NETWORKS AND COMMUNICATION **9**

Introduction to Computer Networks-Layered Architecture-Data Communication Concepts - Transmission Media and Topologies-Internetworking Issues-Internet-TCP/IP Protocols and WWW.

5. APPLICATION OF INFORMATION TECHNOLOGY IN MECHANICAL ENGINEERING **9**

IT applications in Design, Materials, Manufacturing, Automation, Controls, Energy and Industrial Management.

Total No of periods: 45

ME059 Information Technology **3 0 0 3**

Refrence

1. Wing Toy benjamin Zee, Computer hardware/software arichtecture, Prentice Hall of India,1992.
2. Caralo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of software engineering, Prentice Hall of India, 1998.
3. Andrew S. Tanenbaum, Computer Networks, Prentice Hall of India, 1996.

ME060	**Computational Fluid Flow and Heat Transfer**	**3**	**0**	**0**	**3**

1.	**GOVERNING DIFFERENTIAL EQUATIONS**	**9**
2.	**DISCRETIZATION METHODS**	**9**
3.	**HEAT CONDUCTION, CONVECTION AND DIFFUSION**	**9**
4.	**CALCULATION OF FLOW FIELD**	**9**
5.	**TURBULENCE MODELS - ALGEBRAIC MODELS**	**9**

Total No of periods: 45

ME060 Computational Fluid Flow and Heat Transfer	**3**	**0**	**0**	**3**

Text
Refrence