



**ANNA UNIVERSITY**  
**Chennai-25.**  
**Syllabus for**

**B.E.(Full Time) Mechatronics Engineering**

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**CM125 Chemistry I** **3** **0** **0** **100**

**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.

**Total No of periods: 45**

*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.

**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**

*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.*

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

|  |           |
|--|-----------|
| <b>1. MATRICES</b>   | <b>9</b>  |
| 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. |           |
| <b>2. THREE DIMENSIONAL ANALYTICAL GEOMETRY</b>  | <b>9</b>  |
| Direction cosines and ratios - Angle between two lines - Equation of a plane - Equation of a straight line - Coplaner lines - Shortest distance between skew lines - Sphere - Tangent plane - Plane section of a sphere - orthogonal spheres.  |           |
| <b>3. GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS</b>  | <b>9</b>  |
| Curvature - cartesian and polar coordinates - Circle of curvature - Involutives and Evolutives - Envelopes - properties of envelopes - Evolute as envelope of normals.   |           |
| <b>4. FUNCTIONS OF SEVERAL VARIABLES</b>   | <b>9</b>  |
| 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 - differentiation under integral sign.                            |           |
| <b>5. ORDINARY DIFFERENTIAL EQUATIONS</b>  | <b>9</b>  |
| 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.   |           |
| <b>6. TUTORIAL</b>   | <b>15</b> |
| <b>Total No of periods: 60</b>   |           |

*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* ", Volume I (2nd Edition), S. Viswanathan (Printers & Publishers), 1992.
4. Venkataraman, M.K. " *Engineering Mathematics - First year* " National Publishing Company, Chennai (2nd Edition), 2000.

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|---|----------|
| <b>1. PROPERTIES OF MATTER</b>  | <b>9</b> |
| 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. |          |
| <b>2. ACOUSTICS</b>   | <b>9</b> |
| 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.  |          |
| <b>3. HEAT AND THERMODYNAMICS</b>   | <b>9</b> |
| 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.   |          |
| <b>4. OPTICS</b>  | <b>9</b> |
| 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.   |          |
| <b>5. LASER AND FIBRE OPTICS</b>  | <b>9</b> |
| Principle of lasers-laser characteristics-Ruby-NdYAG, He-Ne, CO <sub>2</sub> and semiconductor lasers-propagation of light through optical fibers-types of optical fibre-Applications of optical fibres as optical waveguides and sensors.  |          |

**Total No of periods: 45**

*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 ", Arnold-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.*

- 1. Preparation of standard solutions.
- 2. Estimation of hardness of water by EDTA method
- 3. Estimation of different types and amounts of alkalinity in water - Indicator method
- 4. Determination of dissolved oxygen - Winkler's method.
- 5. Estimation of iron in water - Spectrophotometric method.
- 6. Estimation of sodium in water - Flame Photometric method
- 7. Determination of molecular weight of polymers-Viscometric method.
- 8. Determination of total dissolved solids in water.
- 9. Corrosion experiments:
  - \* Corrosion rate measurements
  - \* Inhibition efficiency.
- 10. Electrochemistry experiments:
  - \* Determination of emf.
  - \* Single electrode potential
  - \* Potentiometric and conductometric titration

**Total No of periods: 30**

**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 4 100**

**1. SHEET METAL 10**

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

**2. WELDING 10**

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

**3. FITTING 10**

Tools and Equipments- Practice in Chipping, Filing, 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**

*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.

**1. PRACTICALS**

**30**

1. Young's modulus by non uniform 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: 30**

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| <b>1. STRESS, STRAIN AND DEFORMATION OF SOLIDS</b>  | <b>6</b> |
| Rigid bodies and deformable solids - Stability, Strength and Stiffness - Tension, Compression and Shear Stresses - Deformation of simple and compound bars - Thermal Stresses - Elastic Constants.  |          |
| <b>2. TRANSVERSE LOADING ON BEAMS</b>   | <b>6</b> |
| Beams - Types and transverse loading on beams - Shear force and bending moment in beams - Cantilevers - Simply supported beams and over-hanging beams.  |          |
| <b>3. STRESSES IN BEAMS</b>   | <b>6</b> |
| Theory of simple bending - Analysis of stress - Local carrying capacity - Proportioning sections - leaf springs - Flitched beams - Shear Stress distribution - Shear flow.  |          |
| <b>4. TORSION</b>   | <b>6</b> |
| 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.   |          |
| <b>5. ANALYSIS OF STATES OF STRESS (TWO DIMENSIONAL)</b>  | <b>7</b> |
| 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.                                 |          |
| <b>6. DEFLECTION OF BEAMS</b>   | <b>7</b> |
| Double integration method - Macaulay's method - Area moment theorems for computation of slopes and deflections in beams - Conjugate beam method.  |          |
| <b>7. ENERGY PRINCIPLES</b>   | <b>7</b> |
| Strain energy and strain energy density - Strain energy in traction, shear flexure and torsion - Castigliano's and Engesser's energy theorems. Principle of virtual work - Application of energy theorems for computing deflection in beams - Maxwell's reciprocal theorem. |          |
| <b>Total No of periods: 45</b>  |          |

*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.*

**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**

*Text Book:*

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

**1. BASIC PRINCIPLES 9**

Principles of current conduction in solid-conductor, insulator and semiconductor. Intrinsic semiconductor-P type, n-type, P-n junction - diode equation, characteristics and applications. Transistor current components-drift and diffusion current, transistor characteristics.

**2. SMALL SINGAL AMPLIFIERS 10**

Transistor biasing, D.C. load line, CE-CB amplifies, small signal analysis h-h parameter model, trequency response, cascaded stages.

**3. FEED-BACK AMPLIFIERS AND OSCILLATORS 8**

Feed back amplifiers-topologies, analysis and effects on gain, bandwidth, noise. Oscillators-principles, classification and basic oscillator circuits.

**4. OPERATIONAL AMPLIFIERS AND APPLICATIONS 12**

Operational amplifies-characteristics, CMRR, block diagram only. Application of opamps-current voltage conversion, aritumatic circuits, differentiation and Integrator, simulation of differential equations, instrumentation amplifiers and elementary filters.

**5. MULTIVIBRATORS AND TIMERS 6**

Collector coupled and complementary collector coupled astable and multivibrators. Triggering delay and switching time calculations, Schmidt trigger. 555 timer, different modes of operations.

**Total No of periods: 45**

*Text :*

- 1. Malvino, Principles of Electronics, PHI, 1985.*
- 2. Gayakward, OP-AMP and linear integrated circuits, Wiely Eastern Publications, 1990.*

*References:*

- 1. Millman and Halkias, Integrated Electronics, McGraw Hill Publishers, 1985.*

**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.

(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  $w = z + a$ ,  $az$ ,  $1/z$ ,  $z^2$  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**

*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 (2nd Edition), S. Viswanathan (Printers & Publishers, Pvt, Ltd.), 1992.
3. Venkataraman, M.K. " *Engineering Mathematics III - A* ", National Publishing Company, Chennai, (13th Edition), 1998.

**1. ENGINEERING MATERIALS 9**

Materials - Structure property relationship - Selection of materials for engineering - Advance modern materials - Crystal structure - Miller indices - density - Packing factor - Space lattices - X-ray diffraction - Imperfections dislocation - Crystal growing techniques.

**2. MECHANICAL PROPERTIES 10**

Tensile - Compression - Hardness - Impact - fatigue - Creep and stress rupture - Comparative study of metals, ceramic, plastic and composite materials - Alloy - solid solution - Ferrous and Nonferrous system, Phase changes Time - Temp. Transformation.

**3. CERAMICS AND COMPOSITES 7**

Modern ceramic materials - cermets - cutting tools - glass ceramics - fibres - Composites - FRP - CRFP materials - Engineering application.

**4. ELECTRONIC MATERIALS 10**

Conducting materials - semiconducting - elemental - Compound semiconductors - properties - Effect of temperature - Band gap energy - Hall effect - Different types of magnetic materials and their properties - Ferrites and insulators - Classification and their application - Optical materials LED/LCD. Photo conducting material - Optical properties and principles of testing.

**5. NON-DESTRUCTIVE TESTING 9**

Liquid penetrant - magnetic particle and Eddy current method - X-ray radiography - Fluoroscopy - Gamma ray - radiography - Ultrasonic scanning method - flaw detector - Thermography.

**Total No of periods: 45**

*References:*

1. Arumugam M., " *Materials Science* ", Anuradha Technical Book Publishers, Kumbakonam, 1997.
2. Van Vlack L.H., " *Material Science for Engineers* ", Addison Wesley, 1985.
3. Raghavan V., " *Materials Science and Engineering* ", Prentice Hall of India, New Delhi, 1993.
4. Pillai S.O., " *Solid State Physics* ", New Age Inc., 1998.

**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.

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|--|-----------|
| <b>1. MULTIUSER OPERATING SYSTEM</b>   | <b>4</b>  |
| Unix: Introduction - Basic Commands - Vi editor - filters - Input/output redirection - piping - transfer of data between devices - shell scripts.  |           |
| <b>2. FUNDAMENTALS OF NETWORKING</b>   | <b>3</b>  |
| Working on a networked environment - Accessing different machines from one node - concept of E-mail - Uses of Internet.  |           |
| <b>3. HIGH LEVEL LANGUAGE PROGRAMMING</b>  | <b>8</b>  |
| C Language: Introduction - Operator - Expressions - Variables - Input/output statements - control statements - function arrays - pointer - structures - unions - file handling - case studies. |           |
| <b>4. TUTORIAL</b>   | <b>45</b> |

**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.*

**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 vessels - Rotary pumps, classification, working, performance curves.

**7. TUTORIAL 15**

**Total No of periods: 60**

*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.*

**1. NUMBER SYSTEM AND BASIC LOGIC 10**

Number systems-Binary, Octal, Hexadecimal, BCD, excess 3, complements conversions and arithmetic. Boolean theorems, Boolean algebra - AND, OR, NOT NAND & NOR operation, sum of product and product of sum forms. Minimization - Karnaugh's map, tabular minimization procedures.

**2. COMBINATIONAL CIRCUITS 10**

Problem formulation and design of combinational circuits, adder/subtractor, Encoder / decoder MUX / DEMUX, comparator, code convertor. Design of combinational circuits. ROM, EPROM, EEPROM, introduction to PAL and PLA and their use in design.

**3. SEQUENTIAL CIRCUITS 10**

Sequential circuits -SR, JK, D, T flip flops, triggering analysis of clocked sequential circuits, ripple counter, synchronous counters. Registers - shift registers, serial to parallel, parallel to serial conversions. Timing signal, RAM, semiconductor memories.

**4. ASYNCHRONOUS SEQUENTIAL CIRCUITS 8**

Stable unstable states, output specifications, cycles and races, Race free assignments, reduction of state and flow tables, hazards, pulse mode sequential circuits.

**5. ALGORITHMIC STATE MACHINES 7**

ASM chart-timing considerations-control implementation-design with multiplexers and PLA.

**Total No of periods: 45**

*Text :*

1. *M.Morris Mano, Digital Circuits and Logic Design, PHI, 1994.*
2. *S.C.Lee, Digital Circuits and Logic Design, PHI, 1989.*

*References:*

1. *W.H.Gothmann, Digital Electronics- Introduction Theory and Practice, PHI, 1992.*
2. *T.L.Flloyd, Digital Fundamentals, PHI, 1986*

**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**

*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.*

(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**

*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 (2nd Edition), 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>

**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 Algebraic 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 - Fundamental 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**

*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 Dukupati 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.*

**CE254 Fluid Mechanics and Machinery Lab**

**0 0 3 100**

**1. EXPERIMENTS ON FLOW MEASUREMENTS 9**

Venturimeter, Orificemeter, Rotometer

**2. EXPERIMENT TO DETERMINE FRICTION FACTOR IN PIPES 6**

**3. EXPERIMENTS TO DRAW THE CHARACTERISTIC CURVES OF PUMPS 12**

Centrifugal pump, submersible pump. Reciprocating pump and Gear pump.

**4. EXPERIMENTS TO DRAW THE CHARACTERISTIC CURVES OF TURBINES 12**

Pelton Wheel, Francis turbine and Turgo impulse wheel

**5. CLASS TESTS 6**

**Total No of periods: 45**



|   |           |
|---|-----------|
| <b>1. GEOMETRY CREATION</b>   | <b>2</b>  |
| Creation of simple geometric bodies using basic primitives (line, arc, circle) and editing the drawing.   |           |
| <b>2. DRAWING STANDARDS</b>   | <b>3</b>  |
| Dimensioning and text writing - concept of layers (creation and setting) line types and forms.  |           |
| <b>3. ADVANCED CONCEPTS OF CAD SOFTWARE</b>   | <b>5</b>  |
| Creation of blocks, attributes for standard parts and inserting them in the drawing.  |           |
| <b>4. DRAFTING</b>  | <b>5</b>  |
| 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. |           |
| <b>5. PRACTICAL</b>   | <b>30</b> |

**Total No of periods: 45**

*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.*

**1. BASIC CONCEPTS AND SYSTEM REPRESENTATION 12**

Terminology and basic structure - feedback control theory - multivariable systems - dynamic models - state variable models - impulse response models and transfer function models - application to mechanical, thermal, hydraulic, pneumatic and electromechanical systems. Block diagram representation and signal flow graphs - control system components.

**2. TIME RESPONSE ANALYSIS AND DESIGN 9**

I and II order systems - performance specifications - feedback analysis - P, PI, PID controllers design - effect of pole, zero addition - desired closed loop pole location - root locus plot and applications - steady state and dynamic error coefficients - robust control.

**3. FREQUENCY RESPONSE ANALYSIS AND DESIGN 9**

Performance specifications - correlation to time domain specifications - bode plots and polar plots - gain and phase margin - constant M and N circles and Nichols chart - all pass and non-minimum phase systems.

**4. STABILITY 9**

BIBO stability - Routh-Hurwitz criterion - stability ranges for a parameter - Nyquist stability criterion - relative stability assessment using Routh and Nyquist criterion and bode plots.

**5. COMPENSATION DESIGN 6**

Design concepts - realization of basic compensation - cascade compensation in time domain and frequency domain (Simple MATLAB applications to analysis and compensators design problems.)

**6. TUTORIAL 15**

**Total No of periods: 60**

*Text Books:*

1. Gopal M. " Control System Principles and Design ", Tata McGraw Hill, 1998.

*References:*

1. Ogatta, " Modern Control Engineering ", Tata McGraw-Hill, 1997.[MATLAB reference]
2. Chesmond C.J., " Basic Control System Technology ", Viva Low Priced Student Edition, 1998.
3. Nagarath I.J. and Gopal M., " Control System Engineering ", Wiley Eastern Ltd., Reprint, 1995.
4. Dutton K., Banaclough W. and Thompson S., " The Art of Control Engineering ", Addison Wesley.
5. Dorf R.C. and Bishop R.H., " Modern Control systems ", Addison-Wesley, 1995 (MATLAB reference)
6. Leonard N.E. and William Levine, " Using MATLAB to Analyse and Design Control Systems ", Addison Wesley, 1995.

|   |           |
|---|-----------|
| <b>1. UNIT I</b>  | <b>12</b> |
| Introduction to Microprocessors: Organisation of a microprocessor based system comparison of microprocessors with mini and large computers typical applications microprocessors of different makes: Intel : Motorola and Zilog. |           |
| Architecture and Organization: Intel 8085: Pin configuration ; internal register organization ; addressing methods ; instruction set  |           |
| <b>2. UNIT II</b>   | <b>8</b>  |
| Memory and I/O interfacing: Logic devices for interfacing Memory interfacing I/O interfacing interrupt structure Programmable interrupt controllers DMA structure programmable DMA controller.                                  |           |
| <b>3. UNIT III</b>  | <b>8</b>  |
| Interface Design: System design using programmable peripheral interface keyboard/ Display controller programmable interval timer programmable communication interface.  |           |
| <b>4. UNIT IV</b>   | <b>7</b>  |
| Input/Output Switches keypads displays stepper motors DC motors analog to digital converters digital to analog converters.  |           |
| <b>5. UNIT V</b>  | <b>10</b> |
| Advanced Microprocessors: Architecture of inter 8085 microprocessor - pin configuration minimum mode maximum mode internal register organization interrupt structure addressing modes multiprocessor architecture support       |           |

**Total No of periods: 45**

*L:45 Total:45*

**TEXT BOOKS:**

1. *RAMESH GAONKAR, " Microprocessor Architecture, Programming and Applications with the 8085 ", Pentech press, 1997.*
2. *KENT STIFLER A. " Design with Microprocessors for Mechanical Engineers " Mc. Graw Hill Book co., Singapore.*

**REFERENCES:**

1. *DOUGLAS V HALL. Microprocessors and interfacing Programming and Hardware, Mcgraw Hill Inc., 1992.*
2. *Microcontroller Hand Book, INTEL 1984.*

**1. UNIT I****12**

Introduction to Microprocessors: Organisation of a microprocessor based system comparison of microprocessors with mini and large computers typical applications microprocessors of different makes: Intel : Motorola and Zilog.

Architecture and Organization: Intel 8085: Pin configuration  $\zeta$  internal register organization  $\zeta$  addressing methods  $\zeta$  instruction set

Introduction to Microprocessors: Organisation of a microprocessor based system comparison of microprocessors with mini and large computers typical applications microprocessors of different makes: Intel : Motorola and Zilog.

Architecture and Organization: Intel 8085: Pin configuration  $\zeta$  internal register organization  $\zeta$  addressing methods  $\zeta$  instruction set

Introduction to Microprocessors: Organisation of a microprocessor based system comparison of microprocessors with mini and large computers typical applications microprocessors of different makes: Intel : Motorola and Zilog.

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Introduction to Microprocessors: Organisation of a microprocessor based system comparison of microprocessors with mini and large computers typical applications microprocessors of different makes: Intel : Motorola and Zilog.

Architecture and Organization: Intel 8085: Pin configuration  $\zeta$  internal register organization  $\zeta$  addressing methods  $\zeta$  instruction set

**2. UNIT II****8**

Memory and I/O interfacing: Logic devices for interfacing Memory interfacing I/O interfacing interrupt structure Programmable interrupt controllers DMA structure programmable DMA controller.

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**3. UNIT III****8**

Interface Design: System design using programmable peripheral interface keyboard/ Display controller programmable interval timer programmable communication interface.

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#### 4. UNIT IV

7

Input/Output Switches keypads displays stepper motors DC motors analog to digital converters digital to analog converters.

Input/Output Switches keypads displays stepper motors DC motors analog to digital converters digital to analog converters.

Input/Output Switches keypads displays stepper motors DC motors analog to digital converters digital to analog converters.

Input/Output Switches keypads displays stepper motors DC motors analog to digital converters digital to analog converters.

#### 5. UNIT V

10

Advanced Microprocessors: Architecture of inter 8085 microprocessor - pin configuration minimum mode maximum mode internal register organization interrupt structure addressing modes multiprocessor architecture support

Advanced Microprocessors: Architecture of inter 8085 microprocessor - pin configuration minimum mode maximum mode internal register organization interrupt structure addressing modes multiprocessor architecture support

Advanced Microprocessors: Architecture of inter 8085 microprocessor - pin configuration minimum mode maximum mode internal register organization interrupt structure addressing modes multiprocessor architecture support

Advanced Microprocessors: Architecture of inter 8085 microprocessor - pin configuration minimum mode maximum mode internal register organization interrupt structure addressing modes multiprocessor architecture support

**Total No of periods: 45**



- 1. POWER SEMICONDUCTOR DEVICES 9**  
Principle of operation - Characteristics and modeling of power diodes, SCR, TRIAC, GTO, power BJT, power MOSFET and IGBT.
- 2. PHASE CONTROLLED CONVERTERS 9**  
2 pulse , 3 pulse and 6 - pulse converters - inverter operation - input power factor - effect of source inductance and firing circuits.
- 3. DC TO DC CHOPPERS 9**  
Voltage, current and load - commutated choppers - step up chopper and firing circuits.
- 4. INVERTERS 9**  
Series inverter - Voltage source inverters - current source inverters - PWM inverters.
- 5. AC VOLTAGE CONTROLLERS 9**  
Single phase AC voltage controller - multi stage sequence control - step up and step down cycloconverters - three phase to single phase and three phase cycloconverters.
- 6. TUTORIALS 15**

**Total No of periods: 60**

*Text Books:*

1. *Rashid, M.H., " Power Electronics - Circuits Devices and Applications ", Prentice Hall International, 1995.*

*References:*

1. *Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., " Thyristorised Power Controllers ", Wiley Eastern Limited, 1986.*
2. *Lander, W., " Power Electronics ", McGraw Hill and Company, Third Edition, 1993.*



**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'Alembert's principle - The principle of superposition - Dynamic 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**

*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 Duggipati 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.*

**1. FUNDAMENTALS OF CUTTING 10**

Mechanics of chip formation-Types of chips produced in cutting - Mechanics of orthogonal and oblique cutting- Cutting forces and power- Temperature in cutting- Tool life: Wear and failure-Surface finish and integrity- Machinability.

**2. MACHINING PROCESSES FOR PRODUCING ROUND SHAPES 10**

Turning parameters-lathes and Lathe operations-High speed machining-Ultraprecision Machining and Hand turning - Cutting screw threads - Boring and bring machines-Drilling and drills-Drilling machines-reaming and reamers-tapping and taps-Design considerations for drilling, reaming and tapping.

**3. MACHINING PROCESSES FOR PRODUCING VARIOUS SHAPES 10**

Milling operations-Milling machines-Planing and shaping-Broaching and broaching machines-Sawing-filling and finishing-gear manufactured by machining.

**4. ABRASIVE MACHINING AND FINISHING OPERATIONS 8**

Abrasives-bounded abrasives-grinding-process-wheel gear-grinding operations and machines-fluids-Design Consideration for grinding-Ultrasonic machining-finishing operations-deburring-economics of grinding and finishing operation.

**5. MACHINE TOOL STRUCTURES AND CUTTING TOOLS 7**

Machine tool structures-Vibration and chatters in machining-Machining economics-Cutting tool steels, cobalt alloys, coated tools. Nitride tools and Diamond-Cutting tool reconditioning-Cutting fluids.

**Total No of periods: 45**

*TEXT BOOK*

*KALPAKJIAN, Manufacturing Engineering and Technology, Addison Wesley, 1995.*

*REFERENCES:*

- 1. P.C.SHARMA, A Text book of Production Technology, S.Chand and Co., Ltd., 1999.*
- 2. KRAR, OSWARD, Technology of Machine Tools, McGraw Hill International Editions, 1991.*
- 3. ROY A LINDBERG, Fourth Edition, Process and Materlas of Manufacture, Prentice-Hall of India, 1994.*
- 4. E.PAUL DeGARMA, J.T.BLACK and RONALD A.KOSHER, Eighth Edition, Materials and Processes in Manufacturing Prentice-Hall of India, 1997.*

**1. PROGRAMMING**

1. Addition of Two 8-bit numbers, Sum of 8-bits and 16bits.
2. Decimal addition of two 8-bit numbers Sum: 16 bits.
3. 8-bit sudraction .
4. 8-bit Decimal subtraction
5. Additional of Two 16-bit numbers, Sum: 16 bits or more.
6. Multibyte Sudraction.
7. Multibyte Subtraction.
8. To arrange a series of numbers in Ascending order.
9. To arrange a series of numbers in Descending order.
10. 8-bit Multiplication.
11. 8-bit Division.
12. Decimal to hexadecimal conversion and Hexadecimal number to Decimal number conversion.

**2. INTERFACING**

1. Anlog to Digital Conversion.
2. Digital to Anlog Conversion.
3. Stepper Motor Controller.

**Total No of periods: 60**