



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

**B.E.(Full Time) Production 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)

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| <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.*

**30**

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**

**1. PHASE RULE 10**

Phase rule - Phase diagram - Binary systems - Solid solutions - Freezing mixtures - Iron - Carbon phase diagram - Heat treatment - Annealing, normalizing and tempering - Alloys - Effect of alloying elements - heat resistant alloys - Fuse alloys and bearing alloys Powder metallurgy - Principle and processes.

**2. FUELS AND COMBUSTION 8**

Classification - Calorific value - Varieties of coal - Analysis - Coke manufacture - Characteristics - Refining of petroleum, gasoline, diesel, Detonation - Octane number, cetane number, Cracking - Synthetic petrol, Gaseous fuels - Production and their uses.

**3. ENVIRONMENTAL POLLUTION 8**

Causes of pollution - Domestic, Industrial and agricultural wastes - Assessment of pollution, DO, BOD and COD - Treatment - Primary and secondary - Sludge disposal. Air pollution - Environmental impact - Acid rain - Green house effect - Global warming, Ozone depletion - Smog - Control measures - Soil pollution - Noise pollution.

**4. SPECIALITY MATERIALS 12**

Classification, production and characteristics of abrasives, Refractories, Explosives, Rocket fuels, Refrigerants, Lubricants - Engineering applications.

**5. BATTERIES 7**

Dry cells, acid, alkaline, Ni-Cd batteries - Fuel cells - UPS.

**Total No of periods: 45**

*References:*

1. *Sharma, B.K., " Industrial Chemistry ", Geol Publication House, 1991.*
2. *Van Vleck, K, " Elements of Material Science and Engineering ", Sixth edition, Wesley publishing Co, New York, 1989.*
3. *Karunanidhi, M., Ayyaswamy, N., Ramachandran,T., and Venkatraman, H., " Applied Chemistry ", Anuradha Agencies, Kumbakonam, 1994.*
4. *P.C.Jain and Monica Jain, " Engineering Chemistry ", Dhanpat Rai Pub.Co.(P) Ltd., New Delhi, 1988.*
5. *R.Gopalan, D.Venkappaya, S.Nagarajan, " Engineering Chemistry ", Vikas Publishing House Pvt.Ltd., 1999.*

**1. ELECTRONIC COMPONENTS AND DEVICES 10**

Resistors, Capacitors, Inductors and Transformers - properties, types and applications, Junction Diodes - characteristics and typical applications, Zener diode, Junction and Field Effect Transistors - structures, characteristics and typical applications - Other Devices - UJT, SCR, LED, Photodetectors.

**2. ANALOG CIRCUITS 10**

Rectifier and Power - Supply Circuits using diodes, Operational Amplifiers (Ideal) - properties and typical circuits, single-stage amplifiers using BJTs and FETs - Basic definitions and characteristics - Multistage Amplifier Principles.

**3. DIGITAL CIRCUITS 10**

Basics of Boolean Logic - Logic Gates, Flip-Flops, Shift-Registers, Counters, Decoders/Drivers, Timer, Display Devices, A/D and D/A Convertors.

**4. MEASUREMENTS AND INSTRUMENTS 7**

Definitions of Accuracy, Precision, Sensitivity, Resolution, Linearity, Range, Measurement of Electrical Quantities - Voltmeter, Ammeter, Watt-meter, CRO, Measurement of Non-electrical Quantities - Typical Transducers, their characteristics and applications - Bridge-circuits, DMM, Scanners and Plotters.

**5. MICROPROCESSORS AND APPLICATIONS 8**

Architecture of 8-bit processors, Address Modes Instruction set, Assembly-language programming, Peripherals and Interfacing - some applications.

**Total No of periods: 45**

*References:*

1. *Millman J., and Grabel, S., " Integrated Electronics ", Tata McGraw Hill, 1995.*
2. *Horowitz P. and Hill W., " The Art of Electronics ", McGraw Hill, 1995.*
3. *Malvino, A.P., Leach, D.P., " Digital Principles and Applications ", Tata McGraw Hill, 1990.*
4. *Sawhney A.K., " A course in Electrical and Electronic Measurements and Instruments ", Dhanpat Rai & Sons, 1988.*
5. *Helfrick A.D., and Cooper, W.D., " Modern Electronic Instrumentation and Measurement Techniques ", Prentice Hall, 1990.*
6. *Goankar R.S., " Microprocessor Architecture, Programming and Applications ", Wiley Eastern, 1992.*

**1. BASIC CONCEPTS AND DC CIRCUITS 9**

Mechanical, Electrical and Thermal units and conversion factors - Ohm's law - electrical resistance - series / parallel resistive circuits - star/delta transformations - Kirchoff's law - node and mesh analysis - Thevenin's and Norton's theorem.

**2. ELECTROMAGNETISM 9**

Magnetic flux - MMF - flux density and intensity - B H curves - simple and composite magnetic circuits - statically induced EMF - self and mutual inductances - coupling coefficient - stored energy - force on a conductor - magnetic pull - force between parallel conductors.

**3. A.C.CIRCUITS 9**

RMS and average value of periodic waves - form factor - phase and phase difference - simple RC.RL and RLC circuits - series and parallel resonance - power and power factor - introduction to three phase systems - power measurement in 3 phase system.

**4. D.C. MACHINES 8**

Construction details of DC machines - principle of operation of DC generator - EMF equation - characteristics of DC generators - principle of DC motor - Back EMF - Voltage and torque equation - characteristics of shunt, series and compound motors - speed control of DC motors.

**5. A.C. MACHINES 10**

Principle of ideal transformer - construction and type - EMF equation - tests on transformer - equivalent circuit - voltage regulation - construction of synchronous machines - principle of alternator - EMF equation - starting of synchronous motor - torque equation - V-curves - induction motor - construction and basic principle of operation - slip - starting and running torques - speed control of induction motor.

**Total No of periods: 45**

*References:*

1. Theraja, B.L., " *A Text Books of Electrical Technology* ", S.S.Chand and Co., New Delhi, 1998.
2. Hughes E., " *Electrical Technology* ", Longmans Greend and Co. Ltd., London, 1979.
3. Edminister J.A., " *Theory and Problems on Electric circuits* ", McGraw Hill International Edition, 1994.
4. Kosow, I.L., " *Electrical Machinery and Transformers* ", 4th Edition, Prentice Hall of India, 1991.
5. Nagrath I.J. and Kothari D.P., " *Theory and Problems of Basic Electrical Engineering* ", Prentice Hall of India, 1998.

(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.

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|---|-----------|
| <b>1. PRINCIPLES OF GRAPHICS</b>  | <b>16</b> |
| Two dimensional geometrical construction - Conic sections, involutes and cycloids - Representation of three dimensional objects - Principles of projections - standard codes of principles. |           |
| <b>2. ORTHOGRAPHIC PROJECTIONS</b>  | <b>28</b> |
| Projections of points, straight line and planes - ' Auxiliary projections ' - Projection and sectioning of solids - Intersection of surfaces - Development of surfaces.                     |           |
| <b>3. PICTORIAL PROJECTIONS</b>   | <b>8</b>  |
| Isometric projections - ' Perspectives ' - Free hand sketching.   |           |
| <b>4. COMPUTER GRAPHICS</b>   | <b>8</b>  |
| 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.

- 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. TUTORIAL 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.*

**1. BASIC CONCEPT 8**

Classification of fluids - Properties - Types of them. Centre-pressure - Plane and curved surfaces - Buoyancy and stability of Floating bodies.

**2. FLUID DYNAMICS 10**

Laws of kinematics of fluid flow. Lagrangian and Eulerian method. Stream function and potential functions. Continuity, momentum and energy equations. Bernoulli's equation and its applications. Pressure measurements pitot static tube, venturimeter, orifice plate Application of momentum equations.

**3. DIMENSIONAL ANALYSIS 8**

Buckingham's Theorem, Non-dimensional numbers, Similarities of flow. Model Studies.

**4. LAMINAR AND TURBULENT FLOWS 10**

Flow relation between shear stress and pressure gradient. Flow between parallel plates. Flow through pipes. Characteristics of turbulent flow. Flow through pipes. Energy losses in pipes. Flow around unversed bodies.

**5. FLUID MACHINERY 9**

Principles of operations of centrifugal and axial pumps, Turbo blowers and turbines. Principles and working of gear, vane and reciprocating pumps.

**Total No of periods: 45**

*References:*

1. *Shames, I.H., " Mechanics of Fluids ", Kogakusha, Tokyo, 1998.*
2. *Rathakrishnan, E., " Introduction to Fluid Mechanics ", Prentice-Hall, India, 1999.*
3. *Yuan S.W., " Foundation of Fluid Mechanics ", Prentice-Hall, 1987.*
4. *Milne Thomson, L.M., " Theoretical Hydrodynamics ", McMillan, 1985.*
5. *Kumar, K.L., " Fluid Mechanics ", Eurasia Publishing House, 1990.*

**1. ENGINEERING THERMODYNAMICS 12**

Systems, Zeroth Law, First Law - Heat and work transfer in flow and non-flow processes, Second law, Kelvin-Planck statement - Clausius statement - concept of entropy - Clausius inequality - entropy change in non-flow processes.

**2. GAS LAWS, AIR CYCLES AND COMPRESSORS 12**

Properties of gases and vapours - Otto, Diesel, Dual combustion and Brayton combustion cycles - Air standard efficiency - Cycle comparisons - Mean effective pressure - Engine performance parameters - reciprocating compressors - Multistage - Minimum work - Effect of clearance - Volumetric efficiency.

**3. STEAM AND ONE DIMENSIONAL FLUID FLOW 12**

Steady flow energy equation - Continuity and energy equation - Properties of steam - Rankine cycle - Isentropic flow of ideal gases through nozzles - Simple jet propulsion system - Thrust rocket motor - Specific impulse.

**4. REFRIGERATION AND AIR CONDITIONING 12**

Principles of refrigeration, Air conditioning - Heat pumps - Vapour compression - Vapour absorption types - Coefficient of performance, Properties of refrigerants.

**5. HEAT TRANSFER 12**

Conduction in parallel, radial and composite wall - Convective heat transfer with laminar and turbulent flows - Overall heat transfer coefficient - Flow through heat exchangers, Fundamentals of radiative heat transfer.

**Total No of periods: 60**

*Text Books:*

1. Nag. P.K., " *Engineering Thermodynamics* ", Tata McGraw Hills Co., Ltd., Seventh Edn., 1993

*References:*

1. Mayhew, A. and Rogers, B., " *Engineering Thermodynamics* ", Longman Green & Co. Ltd., London, E.L.B.S. Edition, 1990.
2. Van Wylen, G.J. and Sonntag, R.E., " *Fundamentals of Classical Thermodynamics (S.I.Version)* ", Second Edition, 1986.
3. Bacon, D.H., " *Engineering Thermodynamics* ", Butterworth & Co., London, 1989.
4. Saad, M.A., " *Thermodynamics for Engineers* ", Prentice-Hall of India Pvt. Ltd., 1989.
5. Reynolds, " *Thermodynamics* ", Int. Student Edn., McGraw Hill Book Co., Ltd., 1990

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|---|-----------|
| <b>1. INTRODUCTION</b>  | <b>12</b> |
| Internal forces - Stresses and strains - Elasticity - Hooke's law - Poisson's ratio - Elastic constants and their relationship - Stress-strain diagrams for ductile materials - Definition of creep, fatigue and stress relaxation - Statically determinate and indeterminate problems. |           |
| <b>2. BENDING OF BEAMS</b>  | <b>12</b> |
| Beams - Loads - Shear force and bending moment diagrams for simply supported and cantilever beams - Pure bending - Bending stresses in straight beams - Shear stresses in bending of rectangular and I section beams - Beams of uniform strength.                                       |           |
| <b>3. TORSION AND COLUMNS</b>   | <b>12</b> |
| Torsion of circular shafts - Shear stresses and twist in solid and hollow shafts - Closely coiled helical springs - Definition of columns - Types of columns - Equivalent length - Slenderness ratio - Rankin's formula.  |           |
| <b>4. BIAXIAL STRESSES</b>  | <b>12</b> |
| Analysis of biaxial stresses - Mohr's circle - Principle stresses and maximum shear stress - Deductions from Mohr's circle - Stresses in thin walled pressure vessels - Combined bending and torsion.   |           |
| <b>5. DEFLECTION OF BEAMS</b>   | <b>12</b> |
| Differential equation of the elastic axis - Double integration and area moment methods - Strain energy in tension, compression, shear, bending and torsion - Castigliano's theorems.  |           |

**Total No of periods: 60**

*References:*

1. *Timoshenko.S. and Young D.H., " Elements of Strength of Materials ", Vol. I and Vol. II, T.Van Nostrand Co., Inc., Princeton, N.J., 1988.*
2. *Malhotra, D.R. and Gupta, H.C., " The Strength of Materials ", Satya Prakasan Tech. India Publications, New Delhi, 1987.*
3. *Kazimi. S.M.A., " Solid Mechanics ", Tata McGraw Hill, 1976.*
4. *Dym. C.L. and Shames I.H., " Solid Mechanics ", McGraw Hill, Kogakusha, Tokyo, 1973.*
5. *Khurmi R.S., " Strength of Materials ", S.C. Chand and Co., 1998.*

(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. INTRODUCTION CASTING, WELDING AND METAL FORMING 9**

Classification and comparison of manufacturing processes - Criteria for selection of a process - casting - sand casting moulding tools - classification of welding processes - Principles and equipment used in gas and arc. Welding - Basic concepts and classification of forming processes - principles - schematic diagrams - powder metallurgy - Introduction - PM components.

**2. UNCONVENTIONAL MACHINING PROCESSES 10**

Need for unconventional processes - principles and applications of the following processes - abrasive jet machining, water jet machining, ultrasonic machining, Electro discharge machining, electrochemical machining, electrochemical grinding, chemical machining, LASER beam machining, electron beam machining, plasma arc machining.

**3. LATHE, MILLING MACHINE AND DRILLING MACHINE 10**

Types of lathes - various operations on lathes - special purpose lathes - Kinematic arrangement of a lathe - work holding devices - types of milling machines - schematic diagrams - operations - milling cutters - mounting of cutters - drilling machines - types - reaming and boring operations.

**4. BORING MACHINE, SHAPER, PLANER, SLOTTING MACHINE AND BROACHING 8**

Schematic diagrams of boring machine, shaper, planer, slotting machine and broaching machine - Operations - tools.

**5. GEAR CUTTING AND FINISHING OPERATIONS 8**

Gear milling, gear shaping, gear hobbing - bevel gear generations - schematic and kinematic diagrams - grinding machines, types - wheel specification - super finishing operations - lapping, honing, burnishing.

**Total No of periods: 45**

*Text Books:*

1. *Hajra Choudhory C.J., " Elements of workshop Technology ", Vol.I and Vol.II, Asia Publishing House, 1992.*

*References:*

1. *Rand R.K., Gupta S.C., " Production Technology ", Khanna Publishers, 1994.*
2. *" H.M.T.Production Technology-Hand book ", Tata McGraw Hill, 1990.*
3. *Gupta R.B., " Production Technology ", Sathya Prakasan, 1993.*
4. *Benjamin, Neibell W., Albn B. Droper, Richard A. Wyste, " Modern Manufacturing Process Engineering ", McGraw Hill, 1990.*

**1. INTRODUCTION AND BASIC PRACTICE 6**

Classification of Drawings - BIS conventions in drawings - Brief revision of basics of Engineering Drawing - Free hand sketching of the following: Orthographic views, Isometric and oblique views of objects.

**2. MACHINE ELEMENTS 15**

Fasteners - Keys - Cotters - Pin Joints - Couplings

**3. RIVETED AND WELDED JOINTS 18**

Types of rivets and riveted joints - Standard weld symbols, welded joints and edge preparations - Bearings, gears and assembly drawings of simple assemblies like (i) stuffing box and Gland (ii) Shaper tool head (iii) Gate valve (iv) screw jack (v) plumber block.

**4. COMPUTER AIDED DRAFTING 6**

2D and 3D Solid models using standard packages basics only

**5. TUTORIAL 15**

**Total No of periods: 60**

*Text Books:*

1. *Narayana K.L., Kanniah P., Venkata Reddy K., " Machine Drawing ", New Age International Limited., New Delhi 1996.*

*References:*

1. *" P.S.G. Design Data Hand Book ", Kalaikathir Printers, Coimbatore, 1987.*
2. *Gupta R.B., " A Text Book on Machine Drawing Technique ", India Publication, New Delhi 1985.*
3. *Bhat N.D., " Machine Drawing (Revised)", 1987.*



|   |           |
|---|-----------|
| <b>1. MECHANISMS</b>  | <b>9</b>  |
| Machine Structure - Kinematic link, pair and chain - constrained motion - slider crank and crank rocker mechanisms - inversions - applications - Kinematic analysis and synthesis of simple mechanisms - Determination of velocity and acceleration in Degrees of freedom - Grueblers criteria                  |           |
| <b>2. FRICTION</b>  | <b>9</b>  |
| Friction in screw and nut - Pivot and collar - Thrust bearing - Plate and disc clutches - Belt (flat and V) and rope drives - Ratio of tensions - Effect of centrifugal and initial tension - Condition for maximum power transmission - Open and crossed belt drive - Jockey pulley - Creep in belts.          |           |
| <b>3. GEARING AND CAMS</b>  | <b>9</b>  |
| Gear profile and geometry - Nomenclature of spur and helical gears - Law of gearing - Interference - Requirement of minimum number of teeth in gears - Gear trains - Simple and compound gear trains - Determination of speed and torque in epicyclic gear trains - Cam profile - Different types of followers. |           |
| <b>4. BALANCING</b>   | <b>9</b>  |
| Static and dynamic balancing - Single and several masses in different planes - Primary and secondary balancing of reciprocating masses - Single and multi cylinder engines - Inline, V and W arrangements of engines.   |           |
| <b>5. VIBRATION</b>   | <b>9</b>  |
| Free, forced and damped vibrations of single degree of freedom systems - Force transmitted to supports - Vibration isolation - Vibration absorption - Torsional vibration of shaft - Single and multi rotor systems - Geared shafts - Critical speed of shaft.  |           |
| <b>6. TUTORIAL</b>  | <b>15</b> |

**Total No of periods: 60**

*Text Books:*

1. Ballaney, P.L., " *Theory of Machines* ", Khanna Publishers, New Delhi, 1998.
2. Singh, V.P., " *Theory of Machines* ", Khanna Publishers, New Delhi, 1998.

*References:*

1. Rao, J.S. and Duggipati, R.V., " *Mechanism and Machine Theory* ", Second Edition, Wiley Eastern Ltd., 1992.
2. Malhotra, D.R. and Gupta, H.C., " *The Theory of Machines* ", Satya Prakashan, Tech. India Publications, 1988.
3. Gosh, A., and Mallick, A.K., " *Theory of Machines and Mechanisms* ", Affiliated East West Press, 1989.
4. Shigley, J.E. and Uicker(K), J.J., " *Theory of Machines and Mechanisms* ", McGraw Hill 1980.
5. Burton Paul, " *Kinematic and Dynamic of Planer Machinery* ", Prentice Hall, 1979.

**1. INTRODUCTION TO MACHINE TOOLS 12**

Machining as a production process - Classification of machinery processes - Principles of machining - Machine Tool Construction - Factors- Kinematic arrangement of different types of machine tools - Work holding and Tool holding devices.

**2. MACHINE TOOL COMPONENTS AND DESIGN 15**

Materials for beds and column - Design of beds and columns - slideways - types - materials - linear notion guideways - Drive system - various types - Advantages and Disadvantages - Design of machine tool structures - Fundamentals.

**3. CONCEPTS AND PROGRAMMING OF CNC MACHINES 15**

Different types of CNC machines - constructional features - Drives and control systems - Accessories - Feed back devices - Manual part programming - Basics - using special functions - canned cycles.

**4. CAPP AND TOOLING 10**

Computer Aided part programm - APT - CAM packages - Tooling for CNC - Interchangeable tooling systems - Preset and qualified tools - classification of tooling - workholding devices - Fixing concepts of CNC.

**5. RECENT ADVANCES 8**

Computer Aided Manufacturing - Concepts - CAD/CAM. Integration - Computer Aided process planning - Internet based manufacturing.

**Total No of periods: 60**

*Text Books:*

1. *Radhakrishnan P., " Computer Numerical Control Machines ", New Central Book Agency, 1996.*

*References:*

1. *Radhakrishnan P., Subramanian S., " CAD/CAM/CIM ", Wiley Eastern, 1994.*
2. *Groover, " Automation, Production Systems and CIM ", Prentice Hall, 1990.*
3. *Thyer GE, " Computer Numerical Control of Machine Tools ", BH.Newners, 1991.*
4. *Krar S., " CNC Technology and Programming ", McGraw Hill, 1990.*
5. *Acherkan N., " Machine Tool Design Vol.III ", MIR Publishers, 1978.*

**1. FUNDAMENTALS 5**

Automation - Concept of LCA - Needs and application of fluid power - Comparison with other power systems - ISO Basic elements - ISO Symbols for fluid Power elements - Hydraulic, pneumatics and selection criteria.

**2. FLUID POWER DRIVES 8**

Positive displacement pumps - Working principle and Construction details - Gear, Vane, Piston pumps - Fluid Power motors - Performance characteristics - Selection and application Hydrostatic transmission drives and characteristics.

**3. FLUID POWER ELEMENTS 8**

Control Valves - Pressure, flow, directions - working principle and construction, Special typevalves, Servo valves, Cartridge valves, modular valves, Selection and actuation methods - Actuator - Selection and specification, cylinder mounting, cushioning, pipe fittings - FRL units, Accumulator.

**4. HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN 12**

Design of hydraulic and pneumatic circuits for automation, selection and specification of circuit components, sequencing circuits, cascade method, modular valves methods, circuits for product handling, packaging and automation of operations on machine tools and presses - logic and fluidic circuits.

**5. PLC AND ELECTROPNEUMATIC CIRCUITS 12**

Use of Electrical timers, switches, solenoids, relays, proximity sensor etc. - electropneumatic sequencing circuits - Cascade method - Karnenigh Veitch map method - Ladder diagram - PLC - Basic elements and function - PLC diagram - PLC based fluid power circuits - programming.

**6. TUTORIAL 15****Total No of periods: 60**

*Text Books:*

1. *Antony Esposito, " Fluid Power with application ", 2nd edition, Prentice Hall, 1988.*

*References:*

1. *" Hydraulic systems handbook ", Utility Publications Ltd., Secundarabad-3, 1990.*
2. *Peter Rohner, " Fluid Power Logic Circuit Design ", The Macmillan Prentice Limited, 1990*

**1. MECHANICAL PROPERTIES OF MATERIALS 7**

Testing of Mechanical properties - TS, CS, Hardness, toughness, creep & fatigue - mechanism of wear & corrosion - Factors affecting/influencing - types & method of prevention.

**2. SELECTION OF MATERIALS 10**

Requirement for Engineering application - ferrous materials - cast iron & steel - types - carbon steel & alloy steel - non ferrous alloys Cu, Mg, Al, Sn, Pb etc., - Plastics - Polymerisation & types of plastics - rubber as Engineering Materials - Ceramic materials - types - composite materials - Smart alloys - Criteria for selection of materials.

**3. BASIC CONCEPTS IN METALLURGY 8**

Review of phase rule & phase diagrams - crystal imperfections - microstudy examination - cooling curves - Eutectic, Eutectoid & Peritectic reaction - Fe C equilibrium diagram - phase structure - TTT diagram - CCR - Non equilibrium conditions.

**4. HEAT TREATMENT 12**

Need for HT - HT Cycle - Annealing, Normalising - Hardening, Tempering - Hardenability study - Jominy end quench test - surface hardening - case hardening - Nitriding, carburising, cyaniding - Selection of HT processes for standard M/C Tool and automobile parts.

**5. WELDING AND FOUNDRY METALLURGY 8**

Effect of thermal distribution in welded joints - HAZ - factors affecting HAZ - cooling & solidification in casting - heat transfer & structural change.

**Total No of periods: 45**

*Text Books:*

1. Avner S.H, " *Introduction to Physical Metallurgy* ", 3rd Edition, McGraw Hill, 1991.

*References:*

1. Lakhtin Yu., " *Engineering Physical metallurgy and heat treatment* ", MIR Publishers, 1985.
2. Higgins R.A., " *Engineering Metallurgy* ", 5th Edition, ELBS, 1983.
3. Arzamasov, " *Material Science* ", MIR Publishers, 1989.
4. Brydson J., " *Handbook - Polymer processing* ", Springer, 1991.
5. Richerson D.W., " *Modern Ceramic Engineering* ", Marcel Dekker, 1992.