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B. Tech. I, Semester – I

Eng. Mathematics- I

L	T	P	Credit
3	1	0	04

- **CALCULUS** (07 Hours) Reorientation of calculus; Differentiation of Hyperbolic and Inverse Hyperbolic functions; Successive Differentiation; standard forms; Leibnitz's theorem and applications; Power series; Expansion of functions; Taylor's and Maclaurin's series.
- **APPLICATIONS OF DERIVATIVES** (08 Hours) Curvature; Radius of curvature; Cartesian; polar parametric curve with application in Engineering problems. Indeterminate forms; L'Hospital's rules.
- **ORDINARY DIFFERENTIAL EQUATION** (08 Hours) Reorientation of differential equation; Exact differential equation and Integrating factors; First order and higher degree odes; solvable for p ; y and x ; Modeling of Real world problems particularly Engg. System; spread of epidemic; spread of new technological innovations; RC and RL network.
- **CURVE TRACING** (05 Hours) Cartesian; polar and parametric form of standard curves.
- **BETA AND GAMMA FUNCTION** (04 Hours) Beta and Gamma function with their properties and duplications formula without proof.
- **APPLICATION OF DEFINITE INTEGRATION** (05 Hours) Area; arc length; surface area by revolving curve; volume by revolving area bounded by curve for Cartesian; polar and parametric curves.
- **MATRICES** (07 Hours) Elementary row and column transformation; rank of matrix; Linear dependence; consistency of linear system of equations; characteristic equation; Caley –Hamilton theorem; Eigen value; Eigen vector.

(Total Contact Time: 44 Hours)

BOOKS RECOMMENDED:

1. James Stewart De Calculus, Thomson Asia, Singapore, 2003.
2. Bali and Iyengar. Engg. Mathematics, Laxmi Publications, New Delhi.
3. O'Neil Peter. 'Advanced Engg. Mathematics', Thompson, Singapore, Ind. Ed. 2002.
4. J. N. Kapur, Mathematical Models in Biology and Medicine. East west Press, New Delhi 1985.
5. F. B. Hilderband, Methods of Applied mathematics, PHI, New Delhi, 1968

Engineering Physics

Wave Optics:

- **Interference:** introduction to waves; Coherence (Spatial and Temporal); Principle of Superposition; Visibility of the fringes; principles of production of coherent sources; YDSE; interference due to thin parallel films and anti reflecting coatings; interference due to wedge shaped film and colors of films; Newton's rings; fringes of equal thickness and fringes of equal inclination.
- **Diffraction:** Fresnel and Fraunhofer diffracting; Fraunhofer diffraction due to double slits; Fraunhofer diffraction due to circular aperture and Rayleigh criterion of image resolution; Introduction to electron microscopes; Diffraction Grating and its usages.
- **Polarization:** Introduction ; Malus law; Polarization by reflection and Brewster's law; Polarization in anisotropic materials and birefringence; Production of elliptically polarized light and plane polarized light; Quarter wave plate and Half wave plate; Analysis and detection of state of polarization of unknown light; Polarization by scattering and blue of the sky.

Laser Physics:

- Introduction Lasers; Mechanisms of Production of laser viz. Spontaneous and stimulated emissions; Generation of metastable states and population inversion; Amplification etc. Einstein's Coefficients; Different kinds of lasers and their working; latest developments in laser physics.

Electromagnetism:

- Amperes theorem and its application to determine magnetic induction in case of i) a straight conductor carrying current ii) Solenoid and iii) Toroid
- Lorentz force; Hall effect in Metal
- High Energy particle accelerator
- Gauss law for magnetism; Types of matter magnetism; Diamagnetism; Paramagnetism; Ferromagnetism; Nuclear Magnetism; three magnetic vectors

Modern Physics:

- Sources of light; cavity radiators; Spectrum power distribution; Wein's Rayleigh; Jean's and Planck's laws; Dual nature of matter and radiation; photoelectric effect; Einstein's photoelectric equation; Compton's scattering; De-Broglie's wave; wave and group velocity; uncertainty principle.
- X-Rays; X-Ray diffractions and Bragg's law; Quantum physics of hydrogen atom; Bohr's postulates and applications in explanation of hydrogen spectrum; Bohr's correspondence principle; Frank and Hertz experiment.

Engineering Chemistry

L	T	P	Credit
3	0	2	04

Water:

- Raw water treatment filtration; Coagulation; Hard water; Estimation and calculation of Hardness; Scales and sludge; Internal and external treatment methods; Boiler feed water; Caustic Embrittlement; Municipal water and its Sterilization; Desalination Methods.

Pollution:

- Two methods Air sampling; effect of air pollutants and their permissible limits; Global warming; Green house effects; Ozone hole; smog; El nino effect; Cottrell electrostatic precipitator and cyclone collector; effects of water pollutants and their permissible limits; COD; BOD and DO Primary and secondary waste water treatments.

Polymers:

- Biopolymers; Elastomers; Number and weight average molecular weight and calculation; Structures and use of polystyrene; Teflon; PMMA; Nylon; Vulcanization of rubber; Moulding Methods; Copolymers and their importance.

Introduction:

- Bio molecules; Nanomaterials; Fullerenes; Super Conductor; Brass alloys; Dyes (Vat & Acid); Drugs (Antimalarial; Antibiotics & Vitamin C); Composites(RCC & plywood)

Instrumental methods:

- Theoretical and experimental: Ph-metry ; Potentiometry; conductometry; calorimetry; Introduction to chromatography

Corrosion:

- Galvanic series; Eletrochemical theory; galvanic corrosion; crevice corrosion & pitting corrosion and its control; General methods of corrosion control.

New approach in chemistry:

- Introduction to electrochemical cells; Introduction to non-conventional sources of energy and Basics of green chemistry.

Engineering Mechanics

L	T	P	Credit
3	0	2	04

- Introduction; Force; Particle; Rigid Body; System of forces.
- Coplanar concurrent forces; Determination of Resultant; Equilibrium; Equilibrant; Forces in space and their equilibrium.
- Coplanar Non concurrent force systems; Moment about Points & Axes; Equilibrium; Non coplanar Non concurrent forces.
- Determination of reactions of beams for point loads; uniformly distributed load and uniformly varying loads.
- Centroids and Moment of Inertia.
- Method of joints and Method of Sections of Truss analysis.
- Friction ; Wedge; Ladder and Belt Friction
- Work Energy Principle; D' Alembert's principle; Impulse momentum; Impact of Elastic Bodies.
- Vibrations; Equation of motion of single degree of freedom; Introduction to free and forced vibrations; Earthquake induced waves.

Engineering Drawing

L	T	P	Credit
2	0	4	4

- **Introduction:** Importance of Engineering Drawing; Drawing instruments and materials; B.I.S. and ISO conventions; lines lettering and dimensioning.
- **Plane Geometry :** Geometrical Construction : line; arc and angle; divisions of straight line and circumference; construction of polygon; Scales : types of scales – plane scale; diagonal scale; vernier scale; functional scale; concept of conversion scale and Nomo gram.
- **Conic Sections:** Ellipse; conjugate diameters; parabola; hyperbola; rectangular hyperbola.
- **Orthographic Projection:** Principle of first and third angle projection; projection of points; projection of straight lines; projection of planes.
- **Building Drawing:** Building components and terminology; building plans; elevation & sections.
- **Solid Geometry:** Projection of solids : polyhedral; prisms; pyramids; cylinder; cone; auxiliary projection method; one view; two view and three view drawings. Missing view; rules for selection of views.
- **Section of Solids:** Sectional view; section plane perpendicular to the HP & VP and other various positions; true shape of sections.
- **Intersection:** Classification; line of interaction; line/generator method and section plane method; intersection of two prisms; two cylinders; interaction of cone and cylinder.
- **Development of Surface:** Method of development; parallel line development; radial line development; developments of cylinder; cone; prism; pyramid; true length of edges – oblique surface.
- **Isometric Projections:** Terminology; isometric scale; isometric view and isometric projection; isometric axes and lines; missing view.

Practical: Based on above theory course.

Books References:

1. K.L. Gopal Krishna, "Engineering g Drawing", Subhas Publications, 1995.
2. N.D. Bhatt, "Engineering Drawing", Chrotar Publishing House, 1989.
3. K. Venugopal, "Engineering Drawing made Easy" Wiley Eastern Ltd., 1993.
4. M.L. Agrawal, R.K. Garg, "Engineering Drawing Vol -I", Dhanpatrai & Co., 1997.

Basics of Civil and Environmental Engineering

L	T	P	Credit
4	0	2	05

- Introduction to civil engineering; relation of civil engineering to other branches of engineering.
- Principles of Surveying; linear measurement; compass surveying; Principles of levelling
- Basic building materials; Properties of Building materials; different types of building materials like stone; brick; cement; lime; mortar; concrete etc.
- Different building components; their types and construction techniques- foundation; masonry (stone/brick); floors. Roofs; staircase; door/windows etc.
- Different types of roads; bridges; dams
- Importance of Environmental engineering; component of environment and their interaction; man & the biosphere; impact of development on environment; natural resources; environmental pollution (air; water; soil; noise)

B. Tech. I, Semester – II

Eng. Mathematics- II

- **DIFFERENTIAL CALCULUS** (07 Hours) Partial differentiation; Euler's theorem for homogeneous function; Modified Euler's theorem; Taylor's and Maclaurin's series for two variables.
- **APPLICATIONS OF PARTIAL DIFFERENTIATION** (08 Hours) Tangent plane and Normal line Error and Approximation; Jacobians with properties; Extreme values of function of two variables; Lagrange's methods of undetermined multipliers.
- **DIFFERENTIAL EQUATION OF HIGHER ORDER** (08 Hours) Solution of homogeneous equations; complementary functions; Particular Integrals; Linear differential equation with variable coefficient; Cauchy's Euler and Legendre's equation with variable coefficient; Method of variation of parameters.
- **MATHEMATICAL MODELS** (07 Hours) Electrical network models; Detection of diabetes model and bending beam models.
- **SERIES SOLUTION AND SPECIAL FUNCTIONS** (07 Hours) Regular point ; Singular point; series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.
- **LAPLACE TRANSFORM** (07 Hours)
Laplace transform; Existence theorem; Laplace transform of derivatives and integrals; Inverse Laplace transform; Unit step functions; Dirac – delta functions ; Laplace transform of periodic functions; Convolutions theorem; Application to solve simple linear and simultaneous differential equations.

(Total Contact Time:
44 Hours)

BOOKS RECOMMENDED:

1. E. Kreyszig: Advanced Engg. Mathematics. 8th Ed, John Wiley & Sons., New York.
2. Jain and Iyenger, Advanced Engg. Mathematics, Narosa Publications, New Delhi.
3. James Steward, Calculus, Thomson Asia, 5 editions, Singapore, 2003.
4. J. N. Kapur, Mathematical Models in Biology and Medicine, East west press.
5. F. B. Hilderbrand , Methods of Applied Mathematics, McGraw Hill, New York

Electro Techniques

- **Electrostatics:** Coulomb's law; electric fields; Gauss Theorem and its applications; potential and potential gradient; point charge and charged sphere; Capacitance: concentric spheres; parallel plates; co-axial cylinders; and parallel conductors; capacitors; capacitors in series; and parallel; capacitance with composite dielectrics; Electric field energy.
- **Electromagnetic:** Ampere's law; magnetic flux and flux density; magnetic field strength due to straight conductors and circular coil; field strength due to solenoid; magneto motive force; magnetic circuit calculations; magnetic leakage; magnetic hysteresis; hysteresis and eddy current losses; Steinmetz exponent; magnetic field energy; lifting power of a magnet. Electromagnetic induction; Faraday's law and Lenz's law; dynamically and statically induced emf; self and mutual inductances.
- **Network Theorems:** Kirchhoff's current and voltage laws: loop and node methods of analysis; Superposition; Thevenin and Reciprocity theorems; Star/Delta transformations; Norton's theorem; Maximum power transfer theorem.
- **R-L-C Circuits:** Alternating voltages and currents and their vector and time domain representations; average and RMS values; form factor; phase difference; power and power factor; purely resistive inductive and capacitive circuits; R-L; R-C and R-L-C series circuits; impedance and admittance; circuits in parallel; series and parallel resonance; locus diagram for series circuits. Complex algebra and its application to circuit analysis.

BOOKS RECOMMENDED:

1. Mehta V. K., "Principles of Power System", S. Chand & Co., 2005.
2. Husain Ashfaq, "Fundamentals of Electrical Engineering", Dhanpat Rai & Co., 2001.
3. Bimbhra P.S., "Electrical machinery", Khanna pub., Delhi, 1998.
4. Mukherjee P.K. & Chakravorti S., "Electrical Machines", Dhanpat Rai Publications, 2001.
5. Ghosh Smarajit, "Fundamentals of Electrical and Electronics Engineering", Prentice-Hall of India, 2005

L	T	P	Credit
3	1	2	05

Fundamentals of computers and programming

- **Introduction to computer and its architecture (01 Hours)** Introduction and Characteristics; Generations; Classifications; Applications; Central Processing Unit and Memory; Communication between various units; Processor speed; Multiprocessor system
- **Memory and various input and output devices (02 Hours)** Introduction to Memory; Memory hierarchy; Primary memory and its types; Secondary Memory; Classification of Secondary memory; Various secondary storage devices and their functioning; their Merits and demerits
- **Number System (01 Hours)** Introduction and type of Number system; Conversion between number system; Arithmetic operations on number system; Signed and unsigned number system
- **Software Computer Languages and Computer Program (04 Hours)** Classification; Examples; Introduction of operating system; Evolution; type and function of OS; Various Examples and comparison; Unix commands; Evolution and classification of programming language; Generation of programming language; Feature and selection of good programming language; Development of program; algorithm and flowchart; Program testing and debugging; Program documentation and Paradigms; Characteristics of good program
- **Data communication; Computer network and Internet Basics (01 Hours)** Data communication and transmission media; Multiplexing and Switching; Computer network and network topology; Communication protocols and Network Devices; Evolution and basic internet term; Getting connected to internet and Internet application; Email and its working; Searching the web; Languages of internet; Internet and viruses
- **Programming using 'C' language (33 Hours)** Characteristics of C language; Identifiers and keywords; Data types Constants and Variables; Declarations and Statements; Representation of expressions; Classification of Operators and Library Functions for Data input and output statements; Conditional Control Statements; Loop control statements; One dimensional array of numbers and characters; Two-dimensional array; Introduction and development of user defined functions; Different types of Variables and Parameters; Structure and union; Introduction to pointers; Pointer arithmetic; Array of pointers; Pointers and functions; Pointers and structures; File handling operations

(Total Contact Time: 42 Hours)

PRACTICALS

- 1). Use of various UNIX commands.
- 2). Implementation in C for control statements.
- 3). Implementation in C for Arrays and Functions.
- 4). Implementation in C for Structures and Pointers.
- 5). Implementation in C for File handling operations

BOOKS RECOMMENDED:

1. ITL Education Solutions Limited, "Introduction to Computer Science", Pearson Education, 200
2. Gottfried B.S., "Programming with C Schaum's outline Series", TMG, 1994
3. B. Ram, "Computer Fundamentals Architecture and Organization", 4/E, New Age International, 2007
4. E Balagurusamy, "Programming in ANSI C", 4/E, TMG, 2007
5. Pradip Dey, "Programming in C", 1/E, Oxford Higher Education, 2007

Basic Mechanical Systems

L	T	P	Credit
3	0	2	04

- Conventional and non-conventional energy sources-types of fuels; Calorific value of fuels; calculation of minimum air required for Complete Combustion of fuel.
- Steam generators; Definition; Classification; general study of Cochran; Babcock Wilcox; Lancashire and Locomotive boilers; boilers mountings and accessories; Draught Classification; Calculation of Chimney height; boiler efficiency and numerical.
- Internal Combustion Engines – Definition; Classification; Components; Working of the two strokes and Four-stroke cycle engines; S.I. And C.I. Engines; various efficiencies. Air standard cycles – Otto; diesel & dual cycle & numerical.
- Layout of different types of power plants – Thermal power plant; Nuclear power plant; Hydro power plant.
- Machine tools: Introduction to different types of machine tool such as lathe; drilling machines; shaper; and various operations; and numerical on machining process.
- Refrigeration and air conditioning: Definition refrigeration and air conditioning; Vapour Compressor system; domestic refrigerator; Ice plant; Wiadoo air conditioner.

Practical/Drawing + Tutorial Assignment: Based on the theory course prescribed above

Books References:

1. R.K. Rajput, "Thermal Engineering", Laxmi Publications, 1994.
2. T.S. Rajan, "Basic Mechanical Engineering", Wiley Eastern Ltd., 1996.
3. S.B. Mathur, S. Domkundwar, "Elements of Mechanical Engineering", Dhanpat Rai & Sons, 1999.
4. S.K. Hajra Chaudhry, "Elements of Workshop Technology Vol. I", Asia Publishing Co. Ltd., 1988.
5. W.A.J. Chapman, "Workshop Technology", ELBS Low Price Text, Edward Donald Pub. Ltd., 1961.
6. A.A. Memon, Sakaria, "Elements of Heat Power", Popular Publications, 1986.
7. H.R. Kapoor, "Thermal Engineering Vol. I and II", Tata McGraw Hill Co. Ltd., 1988.
8. H.S. Bawa, "Workshop Technology", Tata McGraw Hill Publishing Co. Ltd., 1995.
9. M.K. Bhatt, A.A. Memon, S.P. Dubey, "Basic Course in Mechanical Engineering", Popular Prakashan, Surat, 2001.

English and Communication Skills

L	T	P	Credit
2	0	0	02

Spoken English: Following Communicative functions be discussed in meaningful natural dialogue forms: Greetings; Introductions; making request; Suggestions; Invitations; acceptance; refusal; seeking permission; giving a description; stating likes and dislikes; agreeing and disagreeing; stating performances; conversing on telephones; inquires; complains; compliments; encouragements; expressing thanks and apologies etc.(Audio Visual aids could be used for the above)

Written English: Business letters; Structures of business letter s; essential of good business letters; letters of enquiries; Complaints; Request etc. ;Report writing on general as well as scientific topics; Writing formal speeches for occasions like inauguration; introduction of guest speaker's farewell etc; recording and d drafting of minutes of meetings.

References

1. Krishna Mohan and Meera Banerji, "Developing Communication Skills, McMillan Co., 1990
2. N.Krishnaswami and T.Shariram, "Creative English Communication", McMillan Co., 1992
3. King and Cree " Modern Business Letters" Orient Longman, 1990
4. M. I. Joshi, "Let's Talk English", Gujar Prakashan, Ahmedabad., 1995

Basic of Electronics Engineering

L	T	P	Credit
3	0	2	04

DIODE AND IT'S APPLICATION	(08 Hours)
Introduction of Semiconductor Physics, Basic Diode Theory, Half wave Rectifier Circuit, Full wave Rectifier Circuit and Bridge Rectifier Circuit, Filtering Circuits (C, L, L-C & filters), Zener Diode, Photodiode, Light Emitting Diode, Varactor Diode, Shockley Diode, Optoisolator.	
BIPOLAR JUNCTION TRANSISTOR ANALYSIS & DESIGN	(08 Hours)
Transistor Characteristic; Plots For NPN And PNP Configurations; Current Flow Mechanism In The Junction TRansistor And Calculation Of Alpha And Beta; Analysis Of CE Configuration; Current Amplification In The TRansistor; Graphical Analysis Of TRansistor Circuits; Power Calculations; Infinite Bypass Capacitor; Infinite Coupling Capacitors; Different DC Biasing Methods; Fixed Bias, Emitter Stabilized Bias, Potential Divider Bias, DC Bias With Voltage Feedback; Common Base Configuration Analysis; Emitter Follower.	
ELECTRONIC COMMUNICATION:	(08 Hours)
Introduction, Radio frequency specTRum, Modulation, Different types of modulation, Need of Modulation, Basic blocks of Communication System, Block diagram of basic Analog communication system, Block diagram of basic digital Communication systems.	
ELECTRONIC INSTRUMENTS:	(07 Hours)
Cathode Ray Oscilloscope & Digital Storage Oscilloscope Theory And Applications, Function Generator, Power Supply, Digital Multimeter (DMM).	
TRANSISTOR CONFIGURATIONS AND APPLICATIONS:	(07 Hours)
Transistor Theory, Naming the Transistor Terminals, Transistor action, Transistor Symbols, Common Collector, Common Emitter And Common Base Configurations, Different Biasing Techniques, Concept of Transistor Amplifier.	
DIGITAL ELECTRONICS:	(04 Hours)
Number Systems, Different Types of Logic Gates (AND, OR, NOR, NAND, XOR, XNOR, NOT), Combinational Circuits.	
MICROPROCESSOR AND MICROCOMPUTERS:	(04 Hours)
Introduction, Digital Computer, Microcomputer, Microprocessor, Organization of Microprocessor, Programming, of Microprocessor, Application of Microprocessors.	

Total Contact Time:45 Hours
BOOKS RECOMMENDED
1. Malvin Albert & David J. Bates, "Electronic Principles" Tata McGraw Hill, 7th edition, 2007.
2. Floyd and Jain, "Digital Fundamentals", Pearson Education, 2006.
3. Boylestad & Nashlesky, "Electronic Devices & Circuit Theory", PHI Publication, 8th edition, 2002.
4. Kennedy & Devis, "ElecTRonic Communication Systems", THM, 2004.
5. Jain and Anand, "Digital Electronics Practice Using Integrated Circuits", THM, 2004.
6. V. K. Mehta, "Principles of ElecTRonics" S. Chand & Co. Ltd., 2007.
7. Morris Mano, "Digital Logic Design" Pearson Co. 2007