

# RAJASTHAN TECHNICAL UNIVERSITY

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## SYLLABUS OF 1<sup>st</sup> B. E. (Common for all Branches) Applicable only for the session 2006 – 2007

### ENGLISH (101)

Unit	Contents
Unit – I	<b>Text English Communication</b> Second Edition (1995) TTTI (Southern Region) Madras Publication OUP
Unit – II	<b>Reading Comprehension</b> Exercises to develop the following skills <ul style="list-style-type: none"> <li>• Vocabulary</li> <li>• Skimming &amp; Scanning</li> <li>• Note-Taking</li> <li>• Efficient Reading</li> </ul>
Unit – III	<b>Précis Writing</b>
Unit – IV	<b>Report Writing</b>
Unit – V	<b>Letter Writing</b>

### ENGINEERING MATHEMATICS – I (102)

Unit	Contents
Unit – I	<b>Solid Coordinate Geometry</b> <ul style="list-style-type: none"> <li>• Cartesian coordinates in space, Direction Cosines.</li> <li>• Different form of equations of a plane, Angle between two planes, Perpendicular distance of point from a plane, Equation to a plane bisecting the angle between two planes, Volume of a tetrahedron.</li> <li>• Equation of a straight line, Intersection of a plane and a straight line in space. Shortest distance between two non-intersecting straight lines.</li> <li>• Equation of sphere, Intersection of sphere and a plane, Tangent plane and normal lines.</li> </ul>
Unit – II	<b>Solid Coordinate Geometry &amp; Matrices</b> <ul style="list-style-type: none"> <li>• Equation of a right circular cone and a right circular cylinder</li> <li>• Rank of matrix, Inverse of matrix.</li> <li>• Solution of simultaneous linear equations by matrix method</li> <li>• Eigen values &amp; Eigen vectors, Cayley-Hamilton theorem.</li> </ul>
Unit – III	<b>Differential Calculus</b> <ul style="list-style-type: none"> <li>• Asymptotes (Cartesian coordinates only), Curvature.</li> <li>• Concavity, Convexity, Points of inflexion (Cartesian coordinates only)</li> <li>• Simple curve tracing: Cartesian and Polar curves including Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral, Folium of Descartes</li> </ul>
Unit – IV	<b>Differential Calculus</b> <ul style="list-style-type: none"> <li>• Partial Differentiation, Euler's theorem on homogeneous functions.</li> <li>• Approximate Calculations.</li> <li>• Maxima &amp; minima of functions of one &amp; two variables connected by a relation.</li> </ul> <b>Integral Calculus</b> <ul style="list-style-type: none"> <li>• Application of Integral Calculus in finding lengths, areas of simple plane curves</li> </ul>
Unit – V	<b>Integral Calculus</b> <ul style="list-style-type: none"> <li>• Application of Integral calculus in finding volumes &amp; surface of solids of revolution.</li> <li>• Double Integrals, Areas and volumes by double integration.</li> <li>• Change of order of integration.</li> </ul>

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## ENGINEERING MATHEMATICS – II (103)

Unit	Contents
I	<b>Vector Calculus</b> <ul style="list-style-type: none"> <li>• Vector &amp; Scalar Point Functions</li> <li>• Differentiation &amp; Integration of Vector Functions</li> <li>• Gradient, Divergence, Curl</li> <li>• Line Integrals</li> </ul>
II	<b>Linear Programming</b> <ul style="list-style-type: none"> <li>• Introduction to Linear Programming Problems, Mathematical Formulation</li> <li>• Graphical Method to solve a Linear Programming Problem with two variables</li> <li>• Convex Sets and their properties, Theorems on Linear Programming (without proof)</li> <li>• Simplex Algorithm and its Applications to Simple Problems (excluding the cases of degeneracy)</li> </ul>
III	<b>Dynamics</b> <ul style="list-style-type: none"> <li>• Angular Motion, Radial Velocities and Accelerations.</li> <li>• Tangential and normal accelerations.</li> <li>• Rectilinear motion – Simple Harmonic Motion, Motion under inverse square law</li> </ul>
IV	<b>Dynamics</b> <ul style="list-style-type: none"> <li>• Rectilinear motion in a resisting medium.</li> <li>• Circular motion, Banking of tracks</li> </ul>
V	<b>Differential Equation</b> <ul style="list-style-type: none"> <li>• Differential equations of first order and first degree</li> <li>• Linear differential equations of higher order with constant coefficients</li> </ul>

## PHYSICS (104)

Unit	Contents
I	<b>Interference</b> <ul style="list-style-type: none"> <li>• Theory and method of measurement of wavelength using Fresnel's Biprism.</li> <li>• Newton's rings and Michelson interferometer</li> <li>• Measurement of thickness of thin sheet using Biprism</li> </ul> <b>Polarisation</b> <ul style="list-style-type: none"> <li>• Idea of behavior of the electric vector of an EM wave leading to plane.</li> <li>• Circularly and elliptically polarized light.</li> <li>• Production and detection of circularly and elliptically polarized light</li> <li>• Measurement of specific rotation using Half shade and Biquartz Devices</li> </ul>
II	<b>Diffraction</b> <ul style="list-style-type: none"> <li>• Fraunhofer's diffraction at a single slit.</li> <li>• Theory and method of measurement of wavelength by plane diffraction grating</li> <li>• Diffraction of X-ray and matter waves from crystals, Bragg's law</li> <li>• Concept of resolving power, Rayleigh criteria</li> <li>• Resolving power of diffraction grating</li> </ul>
III	<b>Laser &amp; Optical Fibers</b> <ul style="list-style-type: none"> <li>• Spatial &amp; Temporal coherence.</li> <li>• Laser as coherent light criteria of laser action, Ruby and He-Ne lasers</li> <li>• Applications of lasers with special emphasis on Holography.</li> <li>• Elementary idea of optical fibers. Numerical aperture of a fiber</li> </ul>
IV	<b>Special Theory of Relativity &amp; Nuclear Instruments</b> <ul style="list-style-type: none"> <li>• Michelson-Morley experiment. Postulates of special theory of relativity.</li> <li>• Lorentz transformation.</li> <li>• Relativity of length, mass, time and velocity. Mass-Energy relation.</li> <li>• Construction, theory and applications of Geiger-Muller counter, Proportional &amp; Scintillation counters.</li> </ul>
V	<b>Wave Mechanics</b> <ul style="list-style-type: none"> <li>• Photoelectric effect and Compton Effect as evidences of quantum nature of radiation.</li> <li>• Heisenberg's uncertainty principle, Schrödinger's equation for a free particle.</li> <li>• Potential barrier and Tunnel effect. Particle in one and three dimensional box.</li> <li>• Degeneracy, free-electron model of a solid</li> <li>• Density of energy states &amp; Fermi energy.</li> </ul>

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ENGINEERING CHEMISTRY (105)

Unit	Contents
I	<p><b>Water</b></p> <ul style="list-style-type: none"> <li>Common impurities, Hardness, Determination of hardness by Clark's test and Complexometric (EDTA) method, Degree of hardness</li> </ul> <p><b>Municipal Water Supply</b></p> <ul style="list-style-type: none"> <li>Requisites of drinking water, Purification of water, Sedimentation, Filtration, Sterilization, Break Point Chlorination</li> </ul> <p><b>Water for Steam Making</b></p> <ul style="list-style-type: none"> <li>Boiler troubles carry over, Corrosion, Sludge and scale formation and Caustic embrittlement</li> </ul> <p><b>Methods of Boiler Water Treatment</b></p> <ul style="list-style-type: none"> <li>Preliminary treatments, Preheating, Lime-Soda Process, Permutit or Zeolite Process</li> <li>Deionizer or demineralizers, Feed water conditioning, Internal treatment, Blow down, Problems based on water treatment (Lime-Soda Process)</li> </ul>
II	<p><b>Fuels</b></p> <ul style="list-style-type: none"> <li>Chemical fuels: Origin and classification of fuels</li> <li>Solid fuels: Coal, Proximate and ultimate analysis of coal, Significance of the constituents, Gross and net calorific value, Determination of calorific value by Bomb Calorimeter. Coke-Metallurgical Coke-Carbonization process.</li> <li>Manufacture of coke-Beehive Coke ovens and Byproduct Coke ovens</li> <li>Liquid Fuels: Advantages, Petroleum and refining of petroleum, Synthetic Petrol, Refining and reforming of gasoline, Knocking, Octane Number, Knocking -anti knocking Agents, Cracking.</li> <li>Gaseous Fuels: Advantages, Manufacture, Composition and calorific value of coal gas, and oil gas, Determination of calorific values by Junker's calorimeter, Flue gas analysis by Orsat apparatus</li> </ul>
III	<p><b>Phase Rule</b></p> <ul style="list-style-type: none"> <li>Statement, Definition and meaning of the terms involved, Application to one component system. Water and Sulphur systems, Study of two component system: Ag-Pb system</li> </ul> <p><b>Polymers</b></p> <ul style="list-style-type: none"> <li>Plastics: Classifications and constituents of plastics and their uses. Preparation, Properties and uses of Polyethylene, Bakelite, Terylene, and Nylon</li> <li>Rubber: Natural rubber, Vulcanization, Synthetic rubbers viz. Buna-S, Buna-N, Butyl and Neoprene rubbers.</li> </ul> <p><b>Lubricants</b></p> <ul style="list-style-type: none"> <li>Classification, Types of Lubrication, Properties and uses. Viscosity &amp; viscosity index, flash &amp; fire point, Cloud and pour point, Emulsification</li> </ul>
IV	<p><b>Corrosion</b></p> <ul style="list-style-type: none"> <li>Definition and its significance, Theories of corrosion, Galvanic Cell and concentration cell, Pitting and Stress Corrosion, Protection against Corrosion, Protective Metallic coating</li> </ul> <p><b>Pollution</b></p> <ul style="list-style-type: none"> <li>Elementary idea of Air and Water pollution, effect of air pollution. Depletion of ozone layer and its Environmental impact. Substitute of Chlorofluorocarbons, Greenhouse effect.</li> </ul> <p><b>Explosives</b></p> <ul style="list-style-type: none"> <li>Introduction, Classification, Requisites of explosives, Preparation of explosives, Plastic explosives, Blasting fuses, Application of explosives.</li> </ul>
V	<p><b>Cement</b></p> <ul style="list-style-type: none"> <li>Manufacturing of Portland Cement, Vertical shaft Kiln Technology, Chemistry of setting and Hardening</li> </ul> <p><b>Refractories</b></p> <ul style="list-style-type: none"> <li>Definition, properties, Classification, properties of silica and fireclay refractories.</li> </ul> <p><b>Glass</b></p> <ul style="list-style-type: none"> <li>Preparation, Varieties and uses</li> </ul> <p><b>New Engineering Materials</b></p> <ul style="list-style-type: none"> <li>Brief idea of following: Superconductors, Organic electronic materials, Fullerenes and Optical fibers.</li> </ul>

**Electrical & Electronics Engineering (106)**

Unit	Contents
I	<b>DC Networks</b> <ul style="list-style-type: none"> <li>• Kirchoff's Law, Node Voltage &amp; Mesh Current Method</li> <li>• Delta-Star and Star-Delta Transformation, Source Conversion</li> <li>• Classification of Network Elements, Superposition Principle, Thevenin's Theorem</li> </ul>
II	<b>Single Phase AC Circuits</b> <ul style="list-style-type: none"> <li>• Single Phase EMF Generation, Average and Effective Values</li> <li>• Solution of R, L, C Series, Parallel and Series-Parallel Circuits</li> <li>• Complex Representation of Impedances, Phasor Diagram</li> <li>• Power and Power Factor</li> </ul> <b>Three Phase AC Circuits</b> <ul style="list-style-type: none"> <li>• Three Phase EMF Generation, Delta and Star Connection</li> <li>• Line and Phase Quantities</li> <li>• Solution of Three Phase Balanced Circuits</li> <li>• Phasor Diagram</li> <li>• Measurement of Power in Three Phase Balanced Circuits</li> </ul>
III	<b>Transformer</b> <ul style="list-style-type: none"> <li>• Faraday's Law of Electromagnetic Induction</li> <li>• Construction and Principle Operation of Single Phase Transformer, EMF Equation</li> <li>• Voltage and Current Relationship and Phasor Diagram of Ideal Transformer</li> </ul>
IV	<b>Electrical Measuring Instrument</b> <ul style="list-style-type: none"> <li>• Introduction, Types of Measuring Instruments</li> <li>• Deflecting, Controlling and Damping torque, DC PMMC Instruments</li> <li>• Shunts and Multipliers, Moving Iron Ammeter and Voltmeter, Dynamometer, Wattmeter, Induction type energy meter.</li> </ul>
V	<b>Diode Circuits</b> <ul style="list-style-type: none"> <li>• Theory of PN Junction, PN Junction Diode, Zener Diode, Volt-Ampere Characteristics, Diode Resistance, Breakdown Phenomenon</li> <li>• Principle of Operation and Circuits of Half Wave and Bridge Rectifier, Ripple Factor and Ripple Efficiency, Introduction to Filters</li> </ul> <b>Transistors</b> <ul style="list-style-type: none"> <li>• Working principle and Operation of Bipolar Junction Transistor, Transistor Current Components, Characteristics and Basic Principle of Operation of CE, CB and CC Transistor Amplifiers</li> <li>• Introduction to Amplification, Modulation, Demodulation and Oscillation</li> </ul>

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## MECHANICAL ENGINEERING (107)

Unit	Contents
I	<p><b>Basic Concepts</b></p> <ul style="list-style-type: none"> <li>• Thermodynamic systems, Properties, Work and Heat.</li> </ul> <p><b>Working Fluids</b></p> <ul style="list-style-type: none"> <li>• Air and Steam, Calculation of properties air as ideal gas for various thermodynamic processes</li> <li>• Use of stem tables and Molier charts for steams properties.</li> </ul> <p><b>First and Second Law or Thermodynamics</b></p> <ul style="list-style-type: none"> <li>• Non-flow and flow energy equations : Second law statements ;</li> <li>• Carnot cycle; Application of first and second law to ideal gas system subjected to various thermodynamics processes.</li> </ul>
II	<p><b>Internal Combustion Engines</b></p> <ul style="list-style-type: none"> <li>• Otto and Diesel cycles; Thermal efficiency calculations; Classification.</li> <li>• Two and four stroke engines; construction and working of petrol and diesel engines;</li> <li>• Introduction to various systems of IC engines.</li> </ul> <p><b>Gas Turbine Plant</b></p> <ul style="list-style-type: none"> <li>• Ideal Brayton Cycle; Thermal efficiency calculations;</li> <li>• Construction and working of reciprocating and rotary air compressors;</li> <li>• Applications of gas turbines plants.</li> </ul>
III	<p><b>Steam Power Plant</b></p> <ul style="list-style-type: none"> <li>• Simple Rankine Cycle : Thermal efficiency calculation;</li> <li>• Classifications; of steam generators; Construction and working of low and high-pressure boilers;</li> <li>• Introduction to various components of thermal power plants.</li> </ul> <p><b>Refrigeration and Air Conditioning</b></p> <ul style="list-style-type: none"> <li>• Psychometry ; Use of Psychometric charts; Elementary concept of refrigeration and air conditioning;</li> <li>• Vapour compression cycle; Working principles and schematic diagrams of refrigerators, air conditioners and plants.</li> </ul>
IV	<p><b>Manufacturing Processes</b></p> <ul style="list-style-type: none"> <li>• Classification, Principles of working, specification,</li> <li>• Applications of various machine tools, lathe, drilling, shaper, and milling machines,</li> <li>• Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations.</li> </ul>
V	<p><b>Foundry</b></p> <ul style="list-style-type: none"> <li>• Tools, equipments and moulding materials.</li> </ul> <p><b>Gas Welding,</b></p> <ul style="list-style-type: none"> <li>• Arc welding, Soldering and brazing.</li> </ul> <p><b>Power Transmission</b></p> <ul style="list-style-type: none"> <li>• Classification and application of mechanical drives like belts ropes,</li> <li>• Chains and gear drives (excluding epicyclic trains) and their velocity ratios,</li> <li>• Ratio of tensions in belts and ropes.</li> </ul>

## FUNDAMENTALS OF COMPUTER (108)

Unit	Contents
I	<b>Introduction</b> <ul style="list-style-type: none"><li>• Types of Computers and generations, Basic architecture of computers and its building blocks; Input-output Devices, Memories</li></ul>
II	<b>Number Systems</b> <ul style="list-style-type: none"><li>• Binary, Octal, Decimal and Hexadecimal representation of numbers</li><li>• Integers and floating point numbers</li><li>• Representation of Characters: ASCII and EBCDIC codes</li></ul>
III	<b>Classification of Computer Languages</b> <ul style="list-style-type: none"><li>• Machine Assembly and high level languages</li><li>• Brief idea of operating system, assembler, Compiler and interpreter</li></ul> <b>Programming in C</b> <ul style="list-style-type: none"><li>• Need of Programming Languages, Defining problems, Flowcharts and algorithm development</li></ul>
IV	<b>Data</b> <ul style="list-style-type: none"><li>• Data type, constants, variables, operators, and expressions</li><li>• Input and Output Statements, Conditional and control statements, Arrays</li></ul>
V	<b>Structures and Unions, Pointers and file handling</b>

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