

# A.P.P.S.C. Government Polytechnic College Lecturer Posts

## Electronics & Communication Engineering Syllabus

### Paper I: General Studies and Mental Ability

- Major Current Events and Issues of International, National, and State of Andhra Pradesh.
- General Science and its applications to the day to day life Contemporary developments in Science & Technology and Information Technology.
- History of India – emphasis will be on a broad general understanding of the subject in its social, economic, cultural, and political aspects with a focus on AP and the Indian National Movement.
- Geography of India with a focus on Andhra Pradesh.
- Indian polity and Governance: constitutional issues, public policy, reforms and eGovernance initiatives.
- Indian Economy and Planning
- Sustainable Development and Environmental Protection
- **Disaster management:** vulnerability profile, prevention, and mitigation strategies, Application of Remote Sensing and GIS in the Assessment of Disaster
- Logical reasoning, analytical ability, and logical interpretation.
- **Data Analysis:** Tabulation of data Visual representation of data Basic data analysis (Summary Statistics such as mean, median, mode, and variance) and Interpretation.

### Paper II: Mechanical Engineering

#### Fluid Mechanics

Fluid properties— density, viscosity, surface tension; Fluid Statics— Hydrostatics, Fluid forces on planes and curved surfaces, submerged and floating bodies, Buoyancy and stability, Fluid Concepts —Streamlines, streaklines, pathlines, viscous vs inviscid flows, laminar vs turbulent flows, compressible v/s incompressible flows; Bernoulli equation; Control Volume analysis: Basic laws — Mass conservation law, thermodynamic laws, Newton's laws, Angular-Momentum principle; Flows in a pipes and channels - friction factor, flow measurement devices — Venturi meter, Orifice meter. Governing equations of fluid flows— continuity, Euler equations, Navier-Stokes equations, internal flows; external flows, Flow separation;

#### Thermodynamics

Thermodynamic system and control volume, properties and state of a substance, process and cycles, energy, pressure and temperature, Zeroth law, Properties of pure substance, work and heat, First law of thermodynamics, first law analysis for a control volume, Second law of thermodynamics, Entropy, Second law analysis for a control volume, irreversibility and

availability, power and refrigeration cycles —Carnot cycle, Brayton cycle, Diesel cycle, Otto cycle, Stirling cycle, Rankine cycle, vapour compression refrigeration cycle and their variants

### **Material Science**

Crystal geometry and structure determination, structure of solids, crystal imperfections, Phase diagram, diffusion in solids, phase transformations, elastic anelastic and viscoelastic behaviour, phase deformation and creep in crystalline materials, fracture, conductors, resistors, semi - conductors, magnetic materials, dielectric materials

### **Engineering Mechanics and Strength of Materials**

Definition for rigid body, statics, dynamics (kinematics and kinetics); Idealization in mechanics; Vector operations; Resultant of system of coplanar forces (parallelogram and triangular construction); Free body diagram; Resolution of forces in 3D; Equilibrium equation; Shear Force and Bending Moment Diagram; Analysis of trusses — Method of joints and Method of sections; stability of trusses; space trusses; Mass and Geometric properties of members — Centre of gravity and moment of inertia for simple geometries; Parallel and Perpendicular — axes theorem; Kinematics and dynamics of rigid bodies; Virtual work done; Energy method for particles. Tension, compression and shear stresses, axially loaded members, torsion, beam bending, transverse shear, combined loading, and impact loading, deflections of beams, energy methods, analysis of stress and strain, stress transformation, applications of plane stress, pressure vessel, column buckling, and statically indeterminate structures.

### **Manufacturing Processes**

Methods of manufacturing with metals — Basic Principles, Processes, equipment, process variables: Casting - Fundamentals, various types of casting processes; Forming — Rolling, Forging, Extrusion and Drawing, Sheet Metal Forming; Joining — Welding, Brazing, Soldering, Bonding and Mechanical Fastening; Non-Traditional Manufacturing - Thermo-mechanical Processes, Thermo-electrical Processes, Chemical Processes, Thermo-chemical Processes, Hybrid Processes

### **Applied Thermodynamics**

IC Engines - Classification, Basic Working Principles, Components and Engine Operating Events of an IC Engine; Engine Operating Parameters: Geometry, Torque, Power and Work; Fuel Consumption and Efficiencies; SI and CI Engine Cycle Models: Basic Thermodynamic and Thermo-chemistry Analysis Turbo-machine: Basic Principles, Two-dimensional cascades, Thermodynamic analysis of axial flow turbines, axial flow compressors, centrifugal pumps, compressors and hydraulic

Boilers and Condensers: Fire-tube boiler, Water tube boiler, high pressure boilers, boiler draught and performance; types of condensers, jet condenser, surface condenser, condenser efficiency, cooling tower and pond

Reciprocating Air Compressor: Compressed air systems, reciprocating air compressor, thermodynamic analysis, efficiency, free air delivery

## **Heat Transfer and Refrigeration**

Modes of heat transfer, heat conduction — 10 steady state, 10 transient, fins; convective heat transfer — natural and forced convection, convective heat transfer correlations, condensation and boiling, heat exchangers — LMTD and NTU methods. Vapour compression refrigeration systems, types of refrigerants, components in a refrigeration systems — pumps, condensers, expansion devices, evaporators; gas cycle refrigeration, vapour absorption system.

## **Machine Design**

Design consideration-limits, fits, tolerances and standardization, modes of failure, failure theories. Design of shafts under static and fatigue loadings. Design of springs - helical, compression, tension, torsional and leaf springs. Design of joints — threaded fasteners, preloaded bolt joints, welded and glued joints. Design and analysis of sliding and rolling contact bearings. Analysis and applications of power screws and couplings. Analysis of clutches and brakes. Design of belt and chain drives. Design of spur, helical, bevel and worm gears.

## **Machine Drawing and Solid Modelling**

Principle of drawing. Introduction to machine drawing, production drawing, assembly drawing. Different sectional views. Fits, limits, tolerances and surface finish. Solid modelling of different machine elements. Example, threads, bolts, and nuts, welded and riveted joints, shafts, keys, cotter, and pin joints; couplings and clutches, springs, belts, and pulleys; bearings, gears. Assembly of different components of IC engine

## **Theory of Machines**

Introduction to mechanisms, Links, Kinematic pairs, Kinematic chains, Mechanism and Inversions, Kennedy's theorem, Velocity and acceleration in mechanism, Relative velocity methods, Instantaneous center of rotation, Acceleration diagram, Acceleration center. Cams: Synthesis of translating flat-face, translating roller and oscillating roller follower cams. Gears: terminology, fundamental law of gearing, involute profile, Interference and undercutting, minimum number of teeth, contact ratio, bevel helical, spiral and worm gears, Gear Trains — simple, compound and epicyclic gear trains; sliding gear boxes and synchronous gear boxes.

## **Production Engineering**

Principles of Metal cutting: orthogonal and oblique cutting; mechanics of machining; Machine Tools turning, milling, shaping, drilling: Construction and working; Process variables; Cutting tools — nomenclature, material and tool life; Machinability ; Abrasive machining processes- grinding, honing, lapping, burnishing and super finishing: Equipment, process variables and surface features; Surface integrity concepts. Introduction to NC and CNC: Concepts and programming — Constructional features of various machine tools; Introduction to computer integrated manufacturing.

Metrology : Fundamentals of measurements: Errors, Length Standards, Gauging, Comparators, limits & Fits and Tolerances; Role of metrology in quality assurance;

Measurement of geometric forms , Flatness, Straightness, form errors; Slip gauges; Surface finish measurements; Coordinate measuring machines; Vision applications in Metrology; Optical metrology and laser interferometry; Nano measurements

### **Industrial Engineering**

Management functions, Evolution of Management Theory, Management approach to Planning, Analysis and Control functions involved in a Production System; Production cycles, planning functions; Types of industry : Job, Batch, Continuous, Mass and Flow Productions; Organisation and policies in respect of production planning and control; Product design and development; Forecasting techniques; Scheduling, Sequencing and plant loading for optimal utilization; Queueing models and line balancing; Materials Planning and Control, Inventory Management; Value Analysis; Productivity Analysis, Mechanics of production control.