ANNEXURE

Syllabus
(for Electrical Branch/AE)

1.   Electrical Circuits and Networks:

Kirchoff's laws, mesh and node analysis, network theorems, sinusoidal steady state analysis of single phase and three phase circuits, resonance, transient response of RL, RC,RLC circuits for different inputs, to-port networks, Two element network synthesis.

2.   Control Systems:

Modeling of physical systems, Block diagrams and signal flow graphs, Time and frequency domain analysis, Steady state errors, Routh's criterion, Nyquist and Bode plots, compensation, root loci, elementary ideas of state variable analysis, control systems components.

3.   Measurements and Instrumentation:

SI units, measurement of current, voltage, power, power-factor and energy. Measurement of resistance, inductance capacitance and frequency-bridge methods, transducers and their applications to the measurement of non-electrical quantities like temperature, pressure, strain, displacement etc., cathode ray oscilloscope.

4.   Analog and Digital Electronics:

Characteristics of diodes, BJT, FET,SCR, Amplifier biasing, equivalent circuits, frequency response, feedback amplifiers, power amplifiers, oscillators, operational amplifiers and applications, wave shaping circuits, multi-vibrators, flip-flops, universal gate combinational circuits, A/D and D/A converters.

5.   Electrical Machines and power Electronic Drives:

Single phase transformer, equivalent circuit, tests, regulation and efficiency, three phase transformer connections parallel operation, auto transformer, principle of energy conversion, winding of rotating machines, DC generators and motors, characteristics, starting and speed control, three phase induction motors performance characteristics, starting and speed control, single phase induction motors, synchronous generators, performance, regulation, parallel operation, synchronous motors, starting characteristics and applications, synchronous condensers, fractional horse power motors, permanent magnet and stepper motors, Characteristics of Power Electronic devices, phase control, bridge converters, choppers and inverters, basic concepts of adjustable speed drives.

6.   Power Systems:

Electrical power generation thermal, hydro, nuclear : transmission line parameters; steady state performance of overhead transmission lines and cables, surge propagation, distribution systems, insulators, bundle conductors, corona, and radio interference effects; per-unit quantities: bus admittance and impedance matrices: load flow: voltage control and power factor correction; economic operation, symmetrical components, analysis of symmetrical and unsymmetrical faults; principles of over current, differential and distance protections, circuit breaker, concept of system stability, swing curves and equal area criterion.

Syllabus
(for Mechanical branch/AE)

1.   Strength of Materials:

Simple stresses and strains Hooke's law, elastic constants, stress strain curve of mild steel bars of uniform strength, compound bars, temperature stresses, stresses on oblique planes – principal stresses and strains, Mohr's stress circle, shear force and bending moment diagrams for beams, bending and shear stresses in beams, deflections of beams, columns and struts, strain energy, torsion of circular shafts and springs.

2.   Fluid Mechanics and Machinery:

Basic fluid properties, fluid static – pressure measurements, buoyancy and flotation, fluid kinematics, fluid dynamics – Euler's Bernoulli's and Impulse momentum equations, laminar and turbulent flows, flow through pipes and losses in pipes, bends, boundary layer theory, compressible fluid flow, impact of jets, Hydraulic turbines and pumps, Ram, Accumulator and intensifier.

3.   Material science and metallurgy:

Structure and properties of engineering materials, bonding in solids, imperfections in crystals and metals, structure of alloys, manufacture of iron and steel, heat treatment, alloy steels, principles of powder metallurgy.

4.   Theory of Machines:

Displacement, velocity and acceleration analysis of plane mechanisms, dynamic analysis of slider – crank mechanism, gear trains, flywheels.

5.   Vibrations:

Free and forced vibrations, effect of damping, resonance, vibration isolation, critical speeds of shafts.

6.   Design of Machine elements:

Design for static and dynamic loading failure theories, fatigue strength, S-N diagram, design of joints, shafts, bearings, gears, brakes, clutches, screws, springs, cranks, piston, gyroscopes, balancing and governors.

7.   Heat Transfer:

Various modes of heat transfer, fins, heat exchangers, LMTD & NTU methods, unsteady state heat conduction, dimensionless parameters, free and forced convective heat transfer, thermal boundary layer, heat transfer in flow-over flat plates and through pipes, effect of turbulence, radiative heat transfer, shape factors, network analysis, condensation and boiling.

8.   Thermodynamics:

Zeroth, first and second laws of thermodynamics, thermodynamics systems and processes, Carnot cycle, Air-standard cycles, irreversibility and availability, properties

of pure substances, psychometry, Refrigeration and Air conditioning, working principles and their applications.

9. **Applied Thermodynamics:**

classification of compressors and its working principles, Classification of I.C. Engines and its working principles, performances, Design considerations of combustion chambers for C.I. & S.L Engines, knocking, rating of fuels, lubrications, Ignition systems.

10. **Turbo Machines:**

Working principles of gas turbines, steam turbines, Rankine's cycle. Modified Rankine's cycle, jet propulsion and nozzles.

11. **Metal cutting and machine tools:**

Mechanics of machining, single and multi point cutting tools, tool geometry , tool life wear, cutting force analysis, micro finishing machines – EDM, ECM and USM, NC machines, jigs and fixtures. Standards of measurements, limits, fits, tolerances, linear and angular measurements, comparators, lathes, drilling, shaping, planning, milling, gear cutting. Broaching and grinding machines.

12. **Foundry, Welding and Forging:**

Design of patterns moulds and cores, solidification, design consideration of runner, riser and gate. Physics of welding, types of welding and their principles, brazing, soldering, adhesive bonding, Fundamental of hot and cold working processes, forging, rolling, extrusion, drawing, shearing and bending.

13. **Production and operation management:**

Plant layout, material handling, production planning and control, materials, management and work studies, inspections, quality control, cost analysis, operation research, basic concepts of CAD/CAM, inventory control.

Syllabus
(for Electronics branch/AE)

1. Basics of Circuits and Measurement Systems:

Kirchoff's laws, mesh and nodal Analysis, Circuit theorems. One-port and two-port Network Function. Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Statistical analysis of data and curve fitting.

2. Transducers, Mechanical Measurement and Industrial Instrumentation:

Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning. Measurement of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock. Measurement of pressure, flow, temperature and liquid level. Measurement of pH, conductivity, viscosity and humidity.

3. Analog Electronics:

Characteristics of diode, BJT, JFET and MOSFET. Diode circuits. Transistors at low and high frequencies, Amplifiers, single and multi-stage. Feedback amplifiers. Operational amplifiers, characteristics and circuit configurations, Instrumentation amplifier. Precision rectifier. V-to-I and I-to-V converter. Op-Amp based active filters. Oscillators and signal generators.

4. Digital Electronics:

Combinational logic circuits, minimization of Boolean functions. IC families, TTL, MOS and CMOS. Arithmetic circuits, Comparators, Schmitt trigger, timers and mono-stable multi vibrator. Sequential circuits, flip-flops, counters , shift registers, Multiplexer, S/H circuit, Analog-to-Digital and Digital-to-Analog converters. Basics of number system. Microprocessor applications, memory and input-output interfacing. Microcontrollers.

5. Signals, Systems and Communications:

Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first and second order systems. Convolution, correlation and characteristics of linear time invariant systems. Discrete time system, impulse and frequency response. Pulse transfer function. IIR and FIR filters. Amplitude and frequency modulation and demodulation. Sampling theorem, pulse code modulation. Frequency and time division multiplexing. Amplitude shift keying, frequency shift keying and pulse shift keying for digital modulation.

6. Electrical and Electronic Measurements:

Bridges and potentiometers, measurement of R, L and C. Measurements of voltage, current, power, power factor and energy. A.C & D.C current probes. Extension of instrument ranges. Q-meter and waveform analyzer. Digital voltmeter and multi-meter. Time, phase and frequency measurements. Cathode ray oscilloscope. Serial and parallel communication. Shielding and grounding.

7. Control Systems and Process Control:

Feedback principles. Signal flow graphs. Transient Response, steady-state-errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems. Mechanical, hydraulic and pneumatic system components. Synchro pair, servo and step motors. On-off, cascade, P, P-I, P-I-D, feed forward and derivative controller, Fuzzy controllers.

8. Analytical, Optical Instrumentation:

Mass spectrometry, UV, visible and IR spectrometry, X-ray and nuclear radiation measurements. Optical sources and detectors, LED, laser, Photo-diode, photo-resistor and their characteristics. Interferometers, applications in metrology. Basics of fiber optics.

Syllabus
(for Civill branch/AE)

1. Strength of materials and theory of structures:

Simple stresses and strains, Hooke's Law, elastic constants, stress strain curve of mild steel stresses on oblique planes – Principal stresses and strains, Mohr's stress circle, temperature stresses, compound bars, shear force and bending moment diagrams for beams, bending and shear stresses in beams, strain energy principles, torsion of circular shafts – Pure torsion and combined with bending and thrust, deflections of simple beams, thin and thick cylinders, columns and struts, direct and bending stresses, trusses, propped cantilevers and fixed beams, arches, cables and suspension bridges; moving loads and influence lines; static and kinematic indeterminacies, Continuous beams and portal frames-movement distribution, Kani's and matrix methods. Unsymmetrical Bending and shear Centre.

2. Reinforced Concrete:

Materials – properties, grades and tests, workability and mix design of concrete – basic concepts of working stress and limit state methods of design – Limit state design of beams, slabs, columns, footings. Circular and flat slabs, water tanks, bridges – IRC specifications and loadings, Slabs and T – beam bridges, retaining walls, Pre-stressed concrete – basic concepts, losses and analysis and design of beams including end block.

3. Steel structure:

Rivetted and welded joints, Connections – eccentric and framed, simple and compound beams, tension and compression members, plate and gantry girders, roof trusses, plate girder and truss bridges, water tanks, roof trusses, tubular sections and design, transmission towers, column bases, plastic analysis, basic principles, theorems, methods of analysis, analysis and design of determinate and indeterminate beams and frames.

4. Geo-Technical Engineering:

Origin and classification of soils, three phase system, basic definitions and relations, effective stress. Permeability, capillarity and seepage of soils, flownets, flow through earthen dams, compressibility, consolidation and compaction of soils, shear strength, stability of slopes, earth pressures and retaining walls, stress distribution in soils, settlement analysis, subsurface exploration and site investigations, bearing capacity of soils, shallow and deep foundations, pile foundations.

5. Other Topics:

Elements of surveying – Chain, plane table, compass and theodolite, leveling, building materials and construction, formwork, CPM and PERT.

6. Fluid Mechanics and Machinery:

Properties of fluids, pressure measurement fluid statics, buoyancy and flotation, fluid kinematics and fluid dynamics, orifices and mouthpieces, notches and weirs, laminar and turbulent flows, flow through pipes, forces on immersed bodies, flow in open channels, impact of jets, Hydraulic turbines and pumps, dams, power houses, hydrology and hydro power plants.