UPPSC AE Syllabus 2021

UPPSC AE exam is conducted in two parts comprising of paper 1 and paper 2. Paper 1 comprises of Hindi along with subject of candidates. While paper 2 tests general knowledge and grasp over general studies along with subject of candidate.

Paper 1	Hindi	Engineering subject (part A)
Paper 2	General Studies	Engineering subject (part B)

For your better understanding , we will discuss the Hindi and general studies syllabus for **UPPSC AE exam.** Which will be followed by Part A and Part B of respective Engineering subject.

UPPSC AE Hindi Syllabus (Paper 1)

Hindi questions not only test basic grammar and basic knowledge of hind. Hindi syllabus in UPPSC AE exam includes:

- प्रत्यय
- समास
- मुहावरे और लोकोक्तियाँ
- अनेक शब्दों के लिए एक शब्द
- उचित शब्द से दिए गए रिक्त स्थान की पूर्ती
- पर्यायवाची शब्द, विलोम शब्द, शब्द युग्म, लिंग परिवर्तन, वचन परिवर्तन आदी
- वर्ण, वर्तनी और उच्चारण
- वाक्य-क्रम व्यवस्थापन
- उपसर्ग और प्रत्यय
- विपरीतार्थक शब्द
- संधि तथा संधि-विच्छेद
- अनेकार्थक शब्द

UPPSC AE General Studies Syllabus (Paper 2)

Questions are based on current events and persons in news, along with basic General studies static questions. The detailed **UPPSC AE General Studies Syllabus,** is as follows:

- Indian Polity, Economy & Culture
- Current National and International Important Events
- Indian Agriculture, Commerce & Trade
- Population, Ecology & urbanization
- General Science
- Culture and traditions of Uttar Pradesh
- Elementary Mathematics Arithmetic, Algebra, and Geometry.
- History of India
- World Geography & Indian Geography & Natural Resources of India
- Indian National Movement

Questions will also test reasoning capabilities by means of simple reasoning questions.

UPPSC AE Syllabus Civil Engineering

Paper I		**Paper II**	
ENGINEERING MECHANICS, STRENGTH OF MATERIALS AND STRUCTURAL ANALYSIS	ENGINEERING MECHANICS: Units and Dimensions, SI units, vectors, concept of force, Concept of particle and rigid body Concurrent, Non-Concurrent and parallel forces in a plane, moment of force and varignon`s theorem free body diagram, conditions of equilibrium Principle of virtual work, equivalent force system. First and second Moment of area, Mass moment of inertia, Static Friction, inclined plane and bearings, kinematics and kinetics, kinematics in Cartesion and Polar Coordinates, motion under uniform and non-uniform acceleration, motion under gravity, Kinetics of particle: Momentum and Energy	**FLUID MECHANICS, OPEN CHANNEL FLOW, HYDRAULIC MACHINES AND HYDROPOWER ENGINEERING**	Fluid properties and their roles in fluid motion, fluid statics including forces acting on plane and curved surfaces, Kinematics and Dynamics of Fluid flow: Velocity and acceleration, stream lines, equation of continuity, irrotational and rotational flow, velocity potential and stream functions, flownet, methods of drawing flownet, source and sink, flow separation, free and forced vorties. Flow control volume equation,

	principles, D` Alembert`s principle, Collision of elastic bodies, rotation of rigid, bodies, simple harmonic motion. STRENGTH OF MATERIALS: Simple Stress and Strain, Elastic constants, axially loaded compression members, Shear force and bending moment, theory of simple bending, bending stress, Shear Stress, Beams of uniform strength, Leaf Spring, close coiled helical springs, Strain Energy in direct stress, bending & shear. Deflection of beams; Macaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method, Torsion of shafts, Transmission of power, Elastic stability of columns, Euler's Rankin's and Secant formulae. Principal stresses and strains in two dimensions, Mohr's Circle, Theories of Elastic Failure, Thin and Thick cylinder, Stresses due to internal and external pressureLame's equations STRUCTURALANALYSIS: Castiglianios theorems I and II, Unit load method of consistent deformation applied to beams and pin jointed trusses. Slope-		continuity, momentum and energy equations, NavierStrokes equation, Euler's equation of motion and application to fluid flow problems, pipe flow, plane, curved, stationary and moving vanes sluice gates, weirs, orifice meters and Venturi meters. Dimensional Analysis and Similitude: Buckingham's Pi-theorem, dimensionless parameters, similitude theory, model laws, undistorted and distorted models Laminar Flow: Laminar flow between parallel, stationary and moving plates, flow through pipes Boundary Layer: Laminar flow between parallel, stationary and moving plates, flow through pipes Turbulent flow through pipes Characteristics of turbulent flow, velocity distribution, pipe friction factor, hydraulic grade

	deflection, moment distribution, Kani's method of analysis and column Analogy method applied to indeterminate beams and rigid frames. Rolling loads and influence lines: Influence lines for reactions of beam, shear force and bending moment at a section of beam. Criteria for maximum shear force and bending moment in beams traversed by a system of moving loads, influence lines for simply supported plane pin jointed trusses, Arches: Three hinged, two hinged and fixed arches, rib shortening and temperature effects, influence lines in arches, Matrix methods of analysis: Force method and displacement method of analysis of indeterminate beams and rigid frames. Plastic Analysis of beams and frames: Theory of plastic bending, plastic analysis, statical method, Mechanism method. Unsymmetrical bending: Moment of inertia, product of inertia, position of neutral axis and principal axis, calculation of bending stresses.		line and total energy line, siphons, expansion and contractions in pipes pipe networks, water hammer in pipes and surge tanks Open Channel Flow: Flow types, uniform and nonuniform flows, momentum and energy correction factors, Specific energy and specific force, critical depth, resistance equations and roughness coefficient, rapidly varied flow, flow in transitions, Brink flow, Hydraulic jump and its applications, waves and surges, gradually varied flow, classification of surface profiles, control section, Integration of varied flow equation and their solution HYDRAULIC MACHINESAND HYDROPOWER: Centrifugal pumps-Types, characteristics, Net Positive Suction-

			head (NPSH), specific speed, Pumps in series and parallel. Reciprocating pumps, Air vessels, Hydraulic ram, efficiency parameters, Rotary and positive displacement pumps, diaphragm and jet pumps Hydraulic turbines types, classification, Choice of turbines, performance parameters, controls, characteristics, specific speed. Principles of hydropower development: Types, layouts and component works, surge tanks, 'types and choice, Flow duration curves and dependable flow, Storage and pondage, Pumped storage plants, Special types of hydel plants
DESIGN OF STRUCTURES: STEEL, CONCRETE AND MASONRY STRUCTURES. STRUCTU RAL STEEL DESIGN	Factors of safety and load factors, rivetted, bolted and welded joints and its connections, Design by working, stress/limit state method of tension and compression member, beams of built up section,	**Hydrology and Water Resources Engineering**	Hydrologic cycle, precipitation, evaporation, transpiration, infiltration, overland flow, hydrographs, flood frequency analysis,

	rivetted and welded plate girders, gantry girders, stancheons with battens and lacings, slab and gussetted column bases, Design of highway and railway bridges: Through and deck type plate girder, Warren girder, Pratt truss. Reinforced Concrete: Working Stress and Limit State Method of designRecommendations of B.I.S. codes, design of one way andtwo way slabs, stairs-case slabs, simple and continuous beams of rectangular, T and L sections, compression members under direct load with or without eccentricity, isolated and combined footings, Cantilever and counter-fort type retaining walls, Water tanks: Design requirements as per B.I.S. code for rectangular and circular tanks resting on ground, Prestressed concrete: Methods and systems of prestressing, anchorages, analysis and design of sections for flexure based on working stress, losses of prestress, Earth quake resistant design of building as per BIS code. Design of brick masonry as per I. S. Codes, Design of masonry retaining walls.		flood routing through a reservoir, channel flow routing-Muskingam method. Specific yield, storage coefficient, coefficient of permeability confined and unconfined aquifers, radial flow into a well under confined and unconfined conditions, Open wells and tube wells. Ground and surface water recourses single and multipurpose projects, storage capacity of reservoirs, reservoir losses, reservoir sedimentation. Water requirements of crops consumptive use, duty and delta, irrigation methods, Irrigation efficiencies Ground Water flow: Ground and surface water recourses single and multipurpose projects, storage capacity of reservoirs, reservoir losses,

			reservoir sedimentation. Water requirements of crops consumptive use, duty and delta, irrigation methods, Irrigation efficiencies. Canals: Distribution systems for cannal irrigation, canal capacity, canal losses, alignment of main and distributory canals, Design of cannal by kennedy's and Lacey's thoeorie, Water logging and its prevention. Diversion head works: Compenents, Principles and design of weirs on permeable and impermeable foundations, Khosla's theory, Bligh's creep theory Storage works. Cross drainage works. Types of dams, design principles of gravity and earth dams, stability analysis. Spillways: Spillway types energy dissipation

			River training: Objectives of river training, methods of river training and bank protection.
Building Materials, Construction Technology, Planning and Management	Building Materials: Physical properties of construction materials with respect to their use: stones bricks, tiles, lime, glass, cement, mortars, Concrete, concept of mix design, pozzolans, plasticizers, super plasticizers, Special concrete: roller compacted concrete, mass concrete, self compacting concrete, ferro cement, fibre reinforced concrete, high strength concrete, high performance concrete, Timber: properties, defects and common preservation treatments, Use and selection of materials for various uses e.g. Low cost housing, mass housing, high rise buildings. Constructions Technology, Planning and Management: Masonry constructions using brick, stone, construction detailing and strength characteristics paints, varnishes, plastics, water proofing and damp proofing materials. Detailing of walls, floors, roofs, staircases, doors and windows. Plastering, pointing, flooring, roofing	**Transportation Engineering**	Highway Engineering: Principles of Highway alignments, classification and geometric design, elements and standards for roads. Pavement: flexible and rigid pavements Design principles and methodology. Construction methods and materials for stabilized soil. WBM, Bituminous works and Cement Concrete roads. Surface and sub-surface drainage arrangements for roads, culvert structures. Pavement distresses and strengthening by overlays. Traffic surveys and their application in traffic planning, Typical design features for channelized, intersection, rotary etc., signal designs, standard traffic signs and

	and construction features. Retrofitting of buildings, Principle of planning of building for residents and specific uses, National Building code provisions and uses. Basic principles of detailed and approximate estimating, specifications, rate analysis, principles of valuation of real property. Machinery for earthwork, concreting and their specific uses, factors affecting selection of construction equipments, operating cost of equipments. Construction activity, schedules, organizations, quality assurance principles. Basic principle of network CPM and PERT uses in construction monitoring, cost optimization and resource allocation. Basic principles of economic analysis and methods. Project profitability: Basis principles of financial planning, simple toll fixation criterions		markings Railway Engineering: Permanent way, ballast, sleeper, chair and faslenings, points, crossings, different types of turn outs, cross-over, setting out of points, Maintenance of track, super elevation, creep of rails ruling gradients, track resistance tractive effort, curve resistance, Station yards and station buildings, platform sidings, turn outs, Signals and interlocking, level crossings Air port Engineering:Layouts, Planning and design
GEO TECHNICAL ENGINEERINGAND FOUNDATION ENGINEERING	Types of soils, phase relationships, consistency limits particles size distribution, classifications of soils, structure and clay mineralogy. Capillary water, effective stress and pore water pressure, Darcy's Law, factors affecting permeability, determination of permeability, permeability	**Environmental Engineering**	Water supply: Estimation of water demand, impurities in water and their significance, physical, chemical and bacteriological parameters and their analysis, waterborne diseases, standards for potable water

	of stratified soil deposits. Seepage pressure, quick sand condition, compressibility and consolidation, Terzaghi's theory of one dimensional consolidation, consolidation test. Compaction of soil, field control of compaction total stress and effective stress parameters, pore pressure parameters, shear strength of soils, Mohr Coulomb failure theory, shear tests. Earth pressure at rest, active and passive pressures, Rankin's theory Coulomb's wedge theory, Graphical method of earth theory, Graphical method of earth pressure on retaining wall, sheetpile walls, braced excavation, bearing capacity, Terzaghi and other important theories, net and gross bearing pressure. Immediate and consolidation settlement, stability of slope, total stress and effective stress methods, conventional methods of slices, stability number. Subsurface exploration, methods of boring, sampling, penetration tests, pressure meter tests, essential features of foundation, types of foundation, design criteria, choice of type of foundation, stress distribution in soils, Boussinessq's theory,		Water collection & treatment: Intake structures, principles and design of sedimentation tank, coagulation cum flocculation units slow sand filter, rapid sand filter and pressure filter, theory & practices of chlorination, water softening, removal of taste and salinity, Sewerage Systems, Domestic and industrial wastes, storm, sewage, separate and combined systems, flow through sewers, design of sewers Waste water characterization Solids, Dissolved oxygen (DO), BOD COD, TOC, and Nitrogen, Standards for disposal of effluent in normal water course and on to land Waste water treatment Principles and design of wastewater Treatment units--, Screening, grit chamber, sedimentation tank

	Westergaard method, Newmarks chart, pressure bulb, contact, pressure, applicability of different bearing capacity theories, evaluation of bearing capacity from filed tests, allowable bearing capacity, settlement analysis, allowable settlement, proportioning of footing, isolated and combined footings, rafts, pile foundation, types of piles, plies capacity, static and dynamic analysis, design of pile groups, pile load test, settlement of piles lateral loads, foundation for bridges, Ground improvement techniques: sand drains, stone columns, grouting, soil stabilization geotextiles and geomembrane, Machine foundation: Natural frequency, design of machine foundations based on the recommendation of B.I.S. codes		activated sludge process, trickling filters, oxidation ditches, oxidation ponds, septic tank; Treatment and disposal of sludge; recycling of waste water Solid waste management Classification, Collection and disposal of solid waste in rural and urban areas, Principles of solid waste management Environmental pollution Air and water pollution and their control acts. Radioactive waste and their disposal Environmental impact assessment of Thermal power Plants, mines and river valley projects, Sustainable development
		Survey Engineering and Geology	Surveying Common methods and instruments for distance and angle measurements in Civil Engineering works, their use in plane table traverse survey, levelling, triangulation,

			contouring and topographical maps. Survey layouts for culverts canal, bridge, roads, railway alignment and buildings. Basic principles of photogrammetry and remote sensing. Introduction to Geographical information system. Engineering Geology Basic concepts of Engineering geology and its applications in projects such as dams, bridges and tunnels

UPPSC AE Syllabus Mechanical Engineering

Paper I

1. Engineering Mechanics
Analysis of force systems, friction, cendtroid and centre of gravity, trusses and beams, principle of virtual work, kinematics and kinetics of particle, kinematics and kinetics of rigid bodies

2. Mechanism and Machines
Velocity and acceleration of links, cams and followers gears and gear trains clutches, belt drives, brakes and dynamometers, Flywheel and governors, balancing of rotating and reciprocating masses, balancing of multi cylinder engines, Free and forced vibration, damped vibration, whirling of shafts.

3. Mechanics of Solids
Stresses and strains, compound stresses strains, Torsion of circular shafts, stresses and deflections in beams unsymmetrical bending, curved beams, Thin and thick cylinders and spheres, Buckling of columns, Energy methods, helical and leaf springs

4. Desing of Machine Elements
Design for Static and dynamic loading, Theories of failure, fatigue principles of design of rivetted, welded and bolted joints, shafts, springs, bearings, brakes, clutches and flywheels

5. Engineering Materials
Crystal systems and crystallography, crystal imperfections, Alloys and phase diagrams, Heat treatment, ferrous and non ferrous metals and alloys, Mechanical properties and testing.

6.Manufacturing
Metal casting, metal forming, metal joining, Mechanics of metal cutting, machining and machine tool operations, unconventional machining methods limits, fits and tolerances, inspection: Surface roughness, comparators, computer integrated manufacturing, Flexible manufacturing systems, jigs and fixtures

7. Industrial Engineering
Production, planning and control, inventory control and operation, research, CPM and PERT

8. Mechatronics and Robotics
Microprocessors and microcontrollers, Architecture, Programming, Computer interfacing Programmable logic controller, sensors and actuators, Piezoelectric accelerometers, Hall effect sensors, optical encoder, resolver, Inductosyn, Pneumatic and Hydraulic Actuators, stepper motor, control system, mathematical modeling, control signals, controllability and observability, Robotics: Robot classification, robot specification. Notation: Direct and inverse kinematics homogeneous co-ordinates and arm equation of four axix SCARA Robot

Paper II

1. Thermodynamics
Thermodynamic systems and processes, properties of pure substances, concepts and applications of zeroth, first and second law of thermodynamics, entropy, availability and irreversibility, detailed analysis of thermodynamic cycles, ideal and real gases, fuels and combustion

2. Fluid Mechanics
Basic concepts and properties of fluids, manometry, fluid statics, buoyancy, equations of motion, Bernoulli's equation and applications, viscous flow of incompressible fluids, laminar and turbulent flows, flow through pipes and head losses in pipes, dimensional analysis, Forces on immersed bodies and boundary layer over a flat plate, isentropic and adiabatic flows, normal shock waves.

3. Heat Transfer
Modes of heat transfer, steady and unsteady heat conduction, thermocouple time constant, critical thickness of insulation, heat transfer from fins, momentum and energy equations for boundary layer flow on a flat plate. Free and forced convection, radiation heat transfer, Stefan-Boltzmann law, shape factor, black and grey body radiation heat exchange, boiling and condensation, heat exchanger analysis, LMTD and NTU – effectiveness methods

4. Energy Conversion
SI and CI engines, performance characteristics and testing of IC engines, combustion phenomena in SI and CI engines, carburetion and fuel injection systems, emissions and emission control. Reciprocating and rotary pumps, pelton wheel, Francis and Kaplan turbines, velocity diagrams impulse and reaction principles steam and gas turbines; Rankine and Brayton cycles with regeneration and reheat, high pressure boilers, draft, condensers. Unconventional power systems, including nuclear, MHD, biomass, wind and tidal systems, utilization of solar energy; Reciprocating and rotary compressors; theory and applications, Theory of propulsions, pulsejet and ramjet engines.

5. Environmental Control
Vapour compression, vapour absorption, steam jet and air refrigeration systems, properties of refrigerant and their nomenclature, psychometrics properties and processes, psychrometic relations, use of pschrometic chart, load estimation, supply air conditions, sensible heat factors, air conditioning system layout, comfort chart, comfort and industrial air conditioning.

UPPSC AE Syllabus Electrical Engineering

Paper 1

1. Networks and Systems
Steady-state and Transient-state Analysis of systems, Thevenin's-, Norton's-, Superposition- and Maximum Power Transfer-theorems, Driving point Transfer functions, Two-port networks, Laplace and Fourier transforms and their applications in Network analysis, Z-transforms for discrete systems, R-L, R-C & L-C network synthesis.

2. E.M. Theory
Analysis of electrostatic and magnetostatic fields, Laplace, Poission and Maxwell equations, solution of boundary value problems, electromagnetic wave propagation, ground and space waves, Propagation between Earth Station and Satellites.

3. Control Systems
Mathematical modelling of dynamic linear continuous systems, Block diagrams and Signal flow graphs, time-response specifications, steady-state error, RouthHurwitz criterion, Nyquist techniques, Root Loci, Bode Plots, Polar Plot, and stability analysis, Lag-, Lead-, Lag-Lead-compensation, state-space modelling, state transition matrix, controllability and observability.

4. Elements of Electronics
Basics of semiconductor diodes, BJT, FET and their chracteristics, different types of transistors and FET amplifiers equivalent circuits and frequency response, feedback oscillators, colpitts oscillator and Hartley Oscillator, Operational amplifiers-chracteristics and applications

5. Power System Analysis and Design
Line parameters and calculations, Performance of Transmission lines, Mechanical design of overhead lines and Insulators, Corona and radio interference Parameters of single- and three-core Cables, Bus admittance matrix, Load flow equations and methods of solutions, Fast-decoupled load flow, Balance- and Unbalanced-faults analysis, Power system stability, Power system transients and travailing Waves, EHV Transmission, HVDC transmission, Concepts of FACTS, Voltage Control and Economic operation, Concepts of distributed generation, solar and wind power, smart grid concepts.

6. Elements of Electrical Machines
General concepts of E.m.f., m.m.f., and torque in rotating machines, DC Machines: motor and generator characteristics, equivalent circuits, commutation and amature reaction, starting and speed controls of motors; Synchronous Machines: performance, regulation, Parallel operation of generators, motor starting, characteristics and applications, Transformers: phasor-diagram and equivalent circuit, efficiency, and voltage regulation, auto-transformers, 3-phase transformers.

7. Measurement
Basic methods of measurement, Precision and standards, error analysis, Bridges and Poteniometers; moving coil, Moving iron, dynamometer and induction type instruments, measurement of voltage, current, power, energy, and power factor, Instrument transformers, digital voltmeters and multimeters, phase-, time- and frequencymeasurement, Q-meters Oscilloscopes, Basics of sensors, and data acquisition system, Instrumentation systems for pressure and temperature measurements

Paper II

1. Power Electronics and Drives
Semiconductor, power, diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs static characteristics and principles of operation, triggering circuits single phase and threephase controlled rectifiers-fully controlled and half controlled, smoothing and filters regulated power supplies, DC-DC choppers and inverters, speed control circuits for DC and A.C. drives, Basics of electric drives: types, quadrant operation, reversing and braking of electric motors, estimation of power ratings, traction motors.

2. Digital Electronics
Boolean algebra, logic gates, combinational and sequencial logic circuits, multiplexers, muiltivibrators, sample and hold circuits, A/D and D/A converters, basics of filter circuits and applications, active filters, semiconductor memories

3. Microwaves and Communication Systems
Electromagnetic wave in guided media, wave guide components, resonators, microwave tubes, microwave generators and amplifiers

4. Analog Communication Basics
modulation and demodulation, noise and bandwidth, transmitters and receivers, signal to noise ratio, digital communication basics, sampling, quantizing, coding frequency- and time-domain multiplexing, sound and vision broadcast, antennas, transmission lines at audio and ultra-high frequencies.

5. Induction and Special Machines
Three-phase Induction motors Rotating magnetic field, Torque-slip characterstics, Equivalent Circuit and determination of its parameters, starters, speed control, Induction generators. Single phase Induction motors: Theory and phasor diagrams, characteristics, starting and applications, repulsion motor, series motor: E.m.f. equation and phasor diagram and performance, servomotors, stepper motors, reluctance motors, brushless DC motors (BLDC)

6. Power System Protection and Switch Gear
Methods of Arc Extinction, Restriking voltages and recovery voltage, testing of circuit breakers, Protective relays, protective schemes for power system equipment, surges in transmission lines and protection

7. Numerical Methods
Solution of non liner algebraic equations, single and multisteps methods for solution of differential equations.

8. Electrical Engineering Materials
Crystal structure and defects, conducting, insulating and magneting Materials, super-conductors

9. Elements of Microprocessors
Data representation and representation of integer and floating point-numbers. Organization and programming of a microprocessor, ROM and RAM memories CPU of a microcomputer, interfacing memory and I/O devices, Programmable peripheral and communication interface.Application of microprocessors.

UPPSC AE Syllabus Agricultural Engineering

Paper I

1. Thermodynamics and Heat Engines
Concept of energy, temperature and heat equations; laws of thermodynamics, pure substances and their properties; entropy, Rankine, air standard Otto, Diesel and Joule cycles; indicator diagrams

2. Farm Power
Sources and status of power in India; farm power and agricultural productivity relationship; construction and operational features of IC engines, various system of IC engine namely carburetion, ignition, cooling, lubrication; valves and valve timing, special features of diesel engines, tractors and their classification, power transimission, repair and maintenance; tractor testing, and tractor economics; power tillers – their economics and suitability, Energy inAgriculture.

3. Farm Machinery
Design, construction, operation, repair and maintenance of tillage tools, implements and equipment viz. mould board and disk plough; harrows, cultivators, rotary tiller, seeding and planting machines, hoe, weeders, sprayers and dusters; harvester, threshers and combines; soil and crop factors influencing machine performance and energy requirements; selection of farm machines, economics of agricultural mechanization. Earth moving machineries.

4. Heat and Mass Transfer
Thermal properties of materials; steady state and transient heat conduction, natural and forced convection; boiling, condensation, thermal radiation exchange, Heat exchangers, heat and mass transfer analogy; Fick's laws of diffusion, psychrometrics; analysis of heat and mass transfer processes, instrument and measurement systems.

5. Process and Food Engineering
Unit operations in post harvest processing (cleaning, grading, drying, size reduction, evaporation, pasteurization, distillation etc.); processing of cereals, pulses, oilseeds, fruits & vegetables, animal feed, spices, dairy products, meat etc.; design of processing equipment and systems, milking machines.

6. Storage and Handling
Changes in stored products during storage; storage of food grains and their products, perishables (vegetable, fruits, dairy product, meat and eggs) storage system- air tight ventilated, refrigerated, modified atmospheric and controlled atmospheric storages; packaging; conveyors; design and management of storage and handling systems. Reducing losses in storages and handling.

Paper II

1. Hydraulics and Fluid Mechanics
Fluid properties, units and dimensions: surface tension and capillarity, equation of continuity, Bernoulli equation, Laminar and turbulent flow, steady and unsteady flow, Flow of fluids in pipes and open channels, design of open channels for non erosive and non silting velocities, most economical cross section, measurement of irrigation water and other water measuring devices viz. weirs, notches, orifices and flumes

2. Surveying and Leveling
Linear measurements; survey methods and devices used; principle of leveling, simple, differential and profile leveling; Contouring and characteristics of contour lines; Land leveling and grading, earth work estimation.

3. Soil and Water Conservation Engineering
Forms of precipitation; hydrologic cycle; Point rainfall analysis, frequency analysis, agricultural watershed and its management; water management in agri-horti-aquaculture system, mechanics of water and wind erosion; Rational method of prediction of peak runoff and its limitations; concept of unit hydrograph and instantaneous hydrograph; factors affecting erosion and runoff; water erosion control measures – contour cultivation, strip cropping, terracing, afforestation, pastures; Design of gully control structures – temporary and permanent; stream bank erosion; flood routing; flood amelioration by upstream soil water management; wind erosion control measures and sand dunes stabilization

4. Irrigation Pumps
Design, construction, performance characteristics, selection, installation, servicing and maintenance of different pumps (reciprocating, centrifugal, gear, turbine, submersible, propeller, jet); Hydraulic ram; Renewable and non-renewable power sources for pumping solar pumps

5. Irrigation and Drainage Engineering
Water wealth and irrigation in India; Soil water plant relationship; Forms and occurrence of soil water; methods and devices for soil moisture measurement; water requirement of crops; irrigation scheduling; irrigation methods – their hydraulics and design flood, border, furrow, sprinkler and drip irrigation, concept of irrigation efficiencies; water conveyance and control; Design of canals. Lacey and Kennedy's theories. Drainage needs and its benefits; Darcy's Law, hydraulic conductivity; drainage coefficient; drainage methods, surface drainage (drainage of flat and sloping lands); design of open ditches their alignment and construction; designs and layout of subsurface drains; depth and spacing of drains and drainage outlets; installation of drains and drainage wells; drainage of salt affected areas

6. Ground Water Hydrology and Tube Well Engineering
Occurrence and movement of ground water, steady and transient flow into wells, well interference, well drilling, design of well assembly and gravel pack, installation of well screen, completion and development of wells.

7. Rural Engineering
Building materials and their properties; Farm stead planning, and design of dairy barns; poultry, goat-sheep, and piggery housing; selection of site, planning and design of rural houses, farm roads, village drainage; waste disposal and sanitary structures; cost estimates, green house construction.