SCHEME AND SYLLABUS FOR THE POST OF LECTURERS IN GOVERNMENT POLYTECHNICS (ENGINEERING) IN A.P. TECHNICAL EDUCATION SERVICE

Post Code Nos. 15 to 17

PART-A: Written (Objective Type) Examination:

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
<th>Marks</th>
<th>Qns.</th>
<th>Time</th>
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<tbody>
<tr>
<td>Paper-1</td>
<td>General Studies</td>
<td>150</td>
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<td>Paper-2</td>
<td>Concerned Subject</td>
<td>300</td>
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PART-B: ORAL TEST (Interview) 50 Marks

N.B: 1. The paper in concerned subject for Engineering streams is of Engineering Bachelor’s degree standard.
2. The Question papers will be in English only.

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<tr>
<th>Subject Code</th>
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<td>15</td>
<td>Footwear Technology</td>
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<td>16</td>
<td>Sugar Technology</td>
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<td>Physics</td>
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SYLLABUS

01. SCIENCE AND TECHNOLOGY:
   a) General Science and Technology.
   b) Role and impact of science and Technology on India’s development.
   (Questions will cover general appreciation and understanding of matters of everyday observation and experience as may be expected of a well-educated person who has not made a special study of science and technology disciplines).

02. INDIAN HISTORY AND CULTURE:
   a) Modern Indian History from 19th century to the present.
   b) Nationalist Movement and Constitutional development.
   c) Indian Culture and Heritage including architecture, Fine Arts, Dance Forms, Music, Paintings, Folk Arts and performing arts.
   d) History of Andhradesa Society, Culture, Geography and Economic Development.

03. INDIAN POLITY:
   General and broad understanding of the structural (institutions) and functional (processes) aspects of Indian Political System.

04. INDIAN ECONOMY AND GEOGRAPHY OF INDIA:
   a) Structure of National Economy.
   b) Economic Development (including planning) since independence.
   c) Economic Reforms.
   d) Physical, Economic and Social Geography of India.

05. CURRENT EVENTS:

Current Events of Regional, National and International importance.

06. General Mental Ability (reasoning and analytical abilities)
FOOT WEAR TECHNOLOGY

01. Classification of foot wear, leather goods, Garments based on construction, utilization, style, function of foot wear comparison of leather articles and footwear with that are made of non leather.


04. Measurements – Foot drafting – draft length and girth – foot wear scales of different system – conversion from one system to other system.

05. Foot wear functions – Foot and footwear relations shoes boot- parts of shoe and foot wear – Last – Parts of lasts Function of last-Relation between last, shoe and foot leathers garments, sizes leather goods sizes – component – uses.

06. Tools used in manufactures of foot wear, leather goods – leather garments – their sizes – Maintenance – uses of tools last sizes – makes – types of lasts, material – used for making lasts.


12. Seams – different types of seam utility – tools, machines used – working principal of various stitching machines – fixing of various fittings. Machines used, their working principle, specifications – tools used.


15. Finish – various operations involved as finishing of foot wear. Material used – Machines used – cares.


Manufacture of various types of leather goods various operations involved – manufacture of Garment Selection of Raw materials – Method of making – costing.
**BIO-MEDICAL ENGINEERING**

Respiratory Measurements and Aid; Principles and techniques of impedance pneumography and pneumotachograph.


Audiometry: Common Tests and procedures, Airconduction, Bone Conduction, Masking, Schematic Functional Diagram of an Audiometer.

Hearing Aids: Different Types, Comparison of Microphones, Receivers and Amplifiers.

Electro-Surgical Equipment.


Anaesthesia Equipment, Boyle's Apparatus, Gas Distribution Systems.


Introduction to Bio-Medical Instrumentation: General Characteristics of medical instrumentation like linearity, range, frequency response, signal-to-noise ratio and stability.


Electro-encephalography: Block schematic diagram of EEG recording system. General features of different blocks: specification of EEG amplifiers: qualitative requirements, 10-20 electrode system, Resting Rhythms and sleep stages.

Electro Myography: Block schematic diagram of EMG recording system. EMG amplifiers. Design considerations of EMG amplifiers. Data display for EMG.

Blood Pressure and blood flows. Electronic techniques for indirect and direct measurement of blood pressure: measurement of blood flow by electromagnetic, doppler and plethysmographic methods.

Phonocardiography: Origin of heart sounds. Phonocardiographic instrumentation consisting of microphone, filters and signal conditioners.


Electrical hazards during Bioelectric monitoring: safety, Codes, Standards. Micro and Macroschock and their physiological effects. Leakage currents and protection by use of isolation transformers. Equipotential grounding and earth free monitoring.

Electrical factors in Hospital Design: Electrical power supply systems in a hospital building, Proper installation and grounding for providing safe patient - electrical environment.

Ultrasoundics: Basic principles of Medical Ultrasonics, Echo Techniques, Functional Block Diagram of Basic Pulse-Echo System for Diagnostic Purposes. Different Display Modes A-Mode, B-Mode, M-Mode, Types of Scan-B Scan, Principles of Echocardiography and Echoencephalography with Schematic Block Diagrams. Sector Scanners, and phased array scanners.


Computed Tomography: Basic Principles, System Components and Functions of Scanning System, Processing Unit, Reconstruction Techniques - Viewing systems, storage and documentation. Medical applications and safety precautions.


Magnetic Resonance Imaging: Basic Principle, Functional Block Diagram of thermo graphic equipment, scanning and display arrangements for Infra-Red Imaging, Medical applications.


Defibrillators: D.C. Defibrillators of capacitive discharge and delay line capacitive discharge with basic circuit diagrams. Types of electrodes and their features. Testing and safety.

Cardioverters: Working Principles, Scheme of synchronizing D.C. Defibrillators with the R-wave of ECG. Testing and safety. Cardiac pacemakers: Types -
  i. Asynchronous and Synchronous (demand) mode of operation.
  ii. External and implanted, Asynchronous Pacemakers.

Working principles, block diagram and circuit diagram of blocking oscillator asynchronous pacemaker.

Synchronous / Demand Pacemaker: Working principles, modes of triggering-ventricular triggered (QRS triggered) and atrioventricular synchronized pacemaker (P wave triggered).


Prosthetic Heart Valves: Qualitative requirements. Categories Mechanical and tissue valves. Types of mechanical Valves - ball and cage, tilting disc and bileaflet valves. Types of tissue valves - Homografts or allograft (human cadaver) and Heterografts or Xenografts (Porcine or Bovine). In vitro performance testing of prosthetic heart valves using a pulse duplicator.


Physical Therapy Equipment. Short wave, Microwave and Ultrasonic diathermy.


Electrical Activity of the heart. Conduction system of the heart. Characteristics of Action potentials at SA mode, Trab, AV Node, purkinje fibres and ventricles, ECG complexes. The international standard 12 leads of ECG. Standard leads of Einthoven, precordial leads and augmented limb leads. Relationship between unipolar extremity leads and standard bipolar leads. Volume conductor fields: Bio-electric sources, Volume-
conductor formulation. Solid angle computation. Infinite cylindrical axon, core conductor model non-homogenous media, integral equations.

Electrical activity of skeletal muscles-motor unit potentials. EMG wave form. Survace and needle electrodes for EMG. Velocity and their changes in normal and abnormal states. Fatigue and conduction - chemical significance.

Introduction to bioelectric Phenomena of hearing - Mechanical equivalent schematic diagram of the ear. Mechanical transformer of the middle ear. Frequency analysis of sound by the basilar membrane. Cochelear microphonics.

Interaction between Engineering and life sciences. Definition of Biomedical Engineering, its scope. The role of Biomedical Engineer in Health care delivery systems. Medical Electronics Industry Research, Development and education.

Application of Engineering concepts and methods for understanding Physiological systems. Basic electrical and Mechanical properties skeletal systems, muscular system, heart and brain. Nervous system as an internal communication system of the human body, Sense Organs.


Physiological signals, Characteristics, Basis of ECG, EMG, EEG and qualitative treatment of instrumentation for measuring these signals.

Biopotential, Electrodes, Electrode - Electrolyte Interface. Internal electrodes like needle electrodes and microelectrodes.

Equivalent circuit Properties.

Transducers for physiological application. Stratic-types like variable R.L. & C, LVDT, Therma couples, Thermistors Photo electric and Dynamic types like piezoelectric and moving coil type and their applications. Special requirements.

Development of instrumentation for Clinical practice and Medical Research, Introduction. Comparative study of industrial and Medical Instrumentation. Basic classification of Medical Instruments, Instrument characteristics, linearity, range, frequency response, signal to noise ratio and stability.

Broad classification of Biomedical Instrumentation for Clinical practice that is:
1. Instrumentation for Diagnosis, ECG, EEG, EMG, PCG etc.,
2. Therapeutic Devices - Stimulators, diathermy equipments etc.,
6. Data Storage & Analysis - Computers in medicine.
7. Analytical Instruments - Photocolorimetry, Spectrophotometer, Electrophoresis, Centrifuges, Waterbath etc., Hospital illumination, Theatre illumination, Requirements and typical arrangements. Miscellaneous equipment’s.
01. **FUNDAMENTALS:** Coulomb’s law – Ohms law – Farday’s laws of electromagnetic induction, Kirchhoff’s laws, Ampere’s law Resistance, Capacitance and Inductance.

02. **ELECTRONIC CIRCUITS:** Graph, tree and links – Loop currents, node voltages two port networks, Z, Y and Hybrid parameters. Alternating currents, RMS value, form factor, R.L.C. in AC Circuits power; and power factor, network theorems – Harmonic analysis.

03. **ELECTRONIC CIRCUITS:** Logic circuits – Universal gates Booleans functions and their realisation – Product of sums and sums of product forms – Combinational circuits – Sequential circuits, SR & JK flip flops, Series and parallel Counters Registers.

04. **ELECTRICAL MEASUREMENTS:** Indicating instruments, D1 Arsonval type Galvanometer, Vibration Galvanometer, Ballistic Galvanometer, Measurement of resistance, DC & AC Potentiometer meters, Wheatstone Bridge, Kelvin’s bridge, AC Bridges, Maxwell’s, Andunar, Heavinide and Scheing bridges.

05. **ELECTRONIC INSTRUMENTS:** Cathode Ray Oscilloscope and its applications, Electronic Voltmeters – Balanced bridge type, transistor Voltmeter, Choper amplifier type Voltmeter, High Frequency measurements.

06. **INSTRUMENTATION:** Transducers – Primary and Secondary – Classification of transducers, Potentiometers as displacement transducers, strain gauges, Induction and capacitive transducers, LVDT, Rotary variable differential transformer, Piezo electric transducer, Digital Voltmeters, Digital frequency meters, measurement of displacement, strain gauge circuits, measurement of pressure, Measurement of Velocity, measurement of temperature and measurement of flow.
PLASTIC & POLYMERS

I. CHEMICAL ENGINEERING:


3. Mass Transfer: Molecular diffusion in fluids, mass transfer coefficients, Distillation (binary system), gas absorption, drying and liquid extraction operations.

4. Reaction Engineering: Rate of reaction, variables affecting the rate of reaction. Interpretation of kinetic data in batch and flow systems. Theories of reaction rate, classification of reactors, design equations for batch and flow reactors.


8. Material and Energy Balances: Basic calculations, Material balances with and without chemical reactions, energy balances, combustion.


II. ELECTIVE/SPECIALIZATION : PLASTIC AND POLYMERS


Polymerization processes : Bulk polymerization, Solution polymerization, Suspension polymerization and Emulsion polymerization.

Fabrication processes : Injection moulding, Extrusion, Blow extrusion and extrusion blow molding.

Manufacturing Methods of a few common Polymers : LDPE, HDPE, Polystyrene, Polyvinyl chloride, Phenolic resins.

Status of Indian Plastics – Industry with respect to production, location of industries, demand etc.
MINING ENGINEERING

1. GEOLOGY: Structural Geology: Definition and scope. Recognition of faults, folds, joints, unconformities etc., Primary and induced structures, their importance in Mining, Bedding, Lineation, foliation, fracture, Cleat etc., field Geology; importance and scope of filed Geology, field techniques, geological mapping. Use of survey equipment.


3. EXPLORATORY DRILLING: Principles, selection of site, lay outs, details of equipment, methods of drilling and their variation, interpretation of bore hole data.

4. EXPLOSIVES AND BLASTING: Classification, types and use of explosives storage and transport. Blasting techniques in UG and open cost mines.

5. SUPPORTS: Objectives, limitations of mine supports, Types of mine supports and systematic timbering.


7. METAL MINING: Scope and limitations of U/G mining methods, Classification of U/G metal mining systems and their applications in different conditions.


10. MINE ENVIRONMENTAL ENGINEERING: Mine air and environment. Natural and mechanical ventilation, Types, design variables, selection, installation and maintenance. Mine fires, explosions and inundations, Rescue and recovery.

11. MINE LIGISLATION AND SAFETY: Regulations pertaining to conservation's, exploitation of mineral deposits. Safety welfare and hygiene of mine workers.

Sd/- Secretary
16/04/2007
CIVIL ENGINEERING

01. ANALYSIS OF STRUCTURES:
Sending stresses and shear stresses in beams; 
Deflection and slope of beams; 
Combined bending and direct stresses; axially and eccentrically loaded columns; 
Close-Coiled and open-coiled; helical springs under axial load and axial twist; carriage springs; 
Analysis thin and thick cylinders; compound cylinders; 
Analysis of statically determinate plane trusses; method of joints and method of sections. 
Analysis of statically indeterminate beams; proposed canti-levers, fixed beams and continuous beams. 
Influence lines and moving loads on beams and simple bridge trusses.

02. STRUCTURAL DESIGN:
Reinforced concrete, concrete technology, R.C.C. Design, working stress method and limit state method, 
Design of beams, Design of one-way and two-way slabs, design of axially loaded columns, design of continuous beams and slabs; 
Design of wall footings and isolated footings, combined footings, raft foundations, and retaining walls by limit state method, water tanks, Deck-slab and T-beam bridges by working stress method. Structural Steel – design of revetted and welded joints, design of tension members; Compression members, simple and compound beams. Design of plate girders, crane girders and roof-trusses. Elements of pre-stressed concrete.

03. FLUID MECHANICS AND HYDRAULIC MACHINES:
Fluid properties; fluid statics; fluid flow concepts; Laminar and turbulent flow; steady and unsteady -flow, uniform and non-uniform flow; Fundamental EQUATIONS; CONTINUITY EQUATION; Euler’s equation of motion; Bernoulli’s equation, Analysis of liquid jets; flow through orifices and mouth pieces; radial flow, flow along a curved path; Momentum equation and applications; Moment of Momentum equation. Dimensional analysis and similitude; Viscous flow-laminar flow through circular pipes; velocity distribution in laminar flow. Turbulent flow in pipes, velocity distribution in turbulent flow; Flow measurement – pressure moment, velocity measurement and discharge measurement, venturimeter, Orifice, meter, notches and weirs. Hydraulic machines; Turbines and pumps; basic equations; Orifice, performance, selection, specific speed.

04. WATER RESOURCES ENGINEERING:

05. SURVEYING:
Chain surveying; compass surveying, plane table surveying; leveling and contouring, Minor instruments; Areas and Volumes; Theodolite surveying and traversing; Tachometry; Curve ranging; setting out works. Principles and uses of triangulation, hydrographic surveying, Aerial photogrammetry and photo interpretation, remote sensing and electromagnetic distance measurement.

06. GEO-TECHNICAL ENGINEERING:
Physical properties of soils; identification and classification of soils; permeability and seepage; consolidation; shearing strength of soil; stability of earth slopes; site investigation and sub soil exploration. Stress distribution in soil; soil compaction; lateral earth pressure and retaining walls; bearing capacity and shallow foundations; pile foundations; well foundations; Machine foundations.

07. TRANSPORTATION ENGINEERING:
Highway Engineering; classification of roads; highway alignment and surveys; geometric design of highways; elements of traffic engineering; highway materials and testing; elements of pavement design; construction and maintenance of earth gravel, W.B.M., bitumenous and concrete roads; highway drainage. 
Railway Engineering; engineering surveys for a new railway route, gauge and gauge problem; track components; ballast; sleepers; rails anrail fastenings; Station and station yards; requirements and requirement for station yards, signaling and inter locking. Elements of cross drainage works; causeways; culverts; bridges.

08. ENVIRONMENTAL ENGINEERING:
Water supply engineering; sources of water supply, conveyance of water, distribution systems; quality of water; treatment of water; filtration; dis-infection; methods of water treatment. Sanitary engineering; sewerage and sewage disposal; house fittings; design of sewers; characteristics of sewage, primary and secondary treatment of sewage' methods of disposal of sewage.
ELECTRICAL AND ELECTRONICS ENGINEERING

01. ELECTRIC CIRCUITS, FIELDS & MEASUREMENTS:


02. CONTROL SYSTEMS, COMPUTATION AND ELECTRONICS


03. ELECTRICAL MACHINES:


Special machines: Two phase servomotors – stepper motors – methods of operation – metadyne and amplidyne – operating characteristics and applications.

D.C. Machines and Transformers.

04. POWER SYSTEMS:
Generation: Methods of power generation – steam, hydro, nuclear, diesel – selection of site for each – general layout of each type – function of each component – economics of different types – base and peak load stations – pumped stations – simple calculations in hydro station design.


01. FLUID MECHANICS:
Fluid Properties, fluid static’s, Kinematics and Dynamics, Euler’s equation, bernoulli’s energy equation, flow of ideal fluids, Viscous in compressible flows – laminar flow, boundary layer, basic features of turbulent flow, flow through pipes, fluid machinery, Specific speed and classification of fluid machines. Performance and operation of pumps, impulse and reaction turbines, velocity triangles and degree of reaction.

02. THERMO DYNAMICS:

03. MATERIAL SCIENCE:
Structure of metal and alloys, Binding in solids. Imperfections of metals and in crystals, fracture, creep, fatigue and corrosion. Phase Rule, phase transformation diagrams and lever rule.

04. ENGINEERING MECHANICS AND STRENGTH OF MATERIALS:
Equivalent force systems, free body concepts and equations of equilibrium, frictional forces. Kinematics and dynamics of rigid bodies. Stress and strain, elastic limit, yield point and ultimate stress, shear force and bending moment diagrams for beams. Calculation of stress slope and deflection in beams, theories of failure, torsion of circular shaft, thin cylinders, equivalent bending moment for solid and hollow shafts.

05. MANUFACTURING PROCESSES:

06. APPLIED THERMO DYNAMICS:

07. HEAT TRANSFER AND REFRIGERATION:
Modes of heat transfer, one dimensional steady and unsteady heat conduction convective heat transfer forced convection over flat plates and tubes, free convection over cylinders and flat plates radiative heat transfer-black and grey surfaces. Types of heat exchangers – heat exchanger performance LMTD and NTU methods vapor compression cycle analysis. COP; and its estimation vapor absorption refrigeration cycle properties of refrigerators.

08. MACHINE DESIGN:
Design for static and dynamic loading fatigue strength stress concentration, factor of safety designing of bolted, riveted and welded joints, hydro dynamic lubrication, journal and roller bearings design of spur and helical gears, clutches and breaks. Belt and rope drives Design of shafts, keys and couplings.

09. THEORY OF MACHINES:
Constrained motion, plane mechanisms, velocity acceleration analysis, Flywheel and their applications, Balancing of reciprocating and rotating masses cams and followers, Tooth profiles Types of gears Principles of gyroscope, vibration of free and forced one degree of freedom systems with and without damping, critical speed of shaft.

10. PRODUCTION ENGINEERING:
Metal cutting and machining types of chips, chip formation tool wear and tool life, machine ability single point and multi point cutting operations machining processes shaping, planning, turning, milling, grinding, hobbling and drilling operating unconventional machining processes – USM, EDM, ECM and LBM. Basic features of NC Machines tools linear and angular measurements, Comparators, limit gauges, screw and gear measurements.
11. INDUSTRIAL ENGINEERING AND MANAGEMENT:
Industrial organisations and plant layout production planning and control cost of manufacturing. Break even analysis. Time and motion study, basic linear programming and queing theory. PERT / CPM in production systems.
ELECTRONICS & COMMUNICATION ENGINEERING


COMPUTER ENGINEERING

01. Logic families, gates, flip-flops, Multiplexers, decoders, registers, counters, adder circuits, Boolean algebra, Combinational circuit design, minimisation, sequential circuit design, number systems, inter conversion, number representation, computer organisation, instruction formats, addressing modes, micro-programming, ALU organisation, multiplication and division algorithms, memory hierarchy, cache and associate memories, virtual memory, memory IC’s, I/O organisation schemes, interrupts, arbitration, DMA, IOP, micro processors, interfacing, pipeline, SIMD and MIMD organisations, proposition and predicate logic’s, methods of deduction, set theory, relations, functions, algebraic structures, lattices, recursion, combinatorics, graph theory, representation, path matrix, warshall’s algorithm, cyclic and bipartite graphs, planner graphs, Hamiltonian graph, chromatic number, trees, binary tree traversals, representation of expressions, spanning trees, breadth-first and depth-first algorithms, finite automation, pushdown automation, Turing machine, grammars, type 0, 1, 2, and 3, LL and LR grammars.

02. Algorithms, flow-charts, programming methodology, data structures, PASCAL, FORTRAN, COBAL and ‘C’ languages, theory of programming languages, file organisation, searching and sorting; methods, DBMS, database models, query languages, operating system, directory concept, processor scheduling, memory allocation, paging and segmentation, device management, deadlocks and prevention, concurrent processing. DOS and UNIX features, language processors, syntax and semantic analysis, code generation, optimisation, assemblers, loaders and linkers, algorithm design techniques, Computer networks, digital modulation techniques, modems, error detection and error correction, BISYNC and HDLC protocols, OSI model, network routing algorithms, LAN operation methods, Computer graphics, DDA algorithms, graphic primitives, 2-D transformations, graphic input devices, software engineering development life-cycle, system analysis, modular design, testing and validation, CASE tools, AI techniques, natural language understanding, learning, knowledge representation, expert systems, LISP, PROLOG.
AUTOMOBILE ENGINEERING


TEXTILE TECHNOLOGY

I. INTRODUCTION OF TEXTILE FIBRES

1. Introduction of Textile Fibres, their general properties physical and chemical and classification of Textile Fibres. Microscopic view of fibres.

2. Application of cotton fibre and Raw material, cultivation of cotton, common diseases and plant protection methods. Important varieties.


4. SPINNING:
   i) Methods of picking: manual and mechanical
   ii) Ginning: Objectives and methods
   iii) Mixing: Blending of different varieties, types of mixing, auto mixer, aeromixers.
   iv) Blow room line and various machines used in it. Concept of beating point and its use in spinning of different fibres.
   v) Lap defects and remedies
   vi) Calculations regarding better speeds, lap weight, hank of lap, drafts and production.

5. CARDING: Objectives and principles of carding, functioning of carding machine. Types of carding machine. Calculations regarding carding machine, lap sliver study, waste control in carding, Tandem cards, Auto leveler, card sliver, lap feed and chute feed systems.

6. DRAW FRAME: Objects, Principles and various machines used in drawing process. Functions of draw frame machines. Different types of Drafting systems, weighing systems, Roller settings and draft distribution. Calculations regarding draw frame. Study of lapping and lapping machines.

7. COMBER: Objects, principles and different types of combing machines and calculations there of.


9. RING FRAME: Principles, objects and functioning of Ring Frame machines working of Ring Frame and calculations regard ring frame. Traveller, rings and other important parts of ring spinning frame. Drafting systems. Yarn defects – causes and remedies. Calculations regarding spinning.


II. WEAVING:


3) Principles of weaving process. Basic requirements of weaving loom and types of looms. Study of handlooms and plain powerlooms. Working of the mechanisms faults and remedies with references to the powerloom weaving and cloth production.


5) Fabric Structure: Principles of fabric structures. Different types of weaves and their construction. Drafting and peg plans according to weaves, Double Cloth, Dobby nd Jaquard designs.


8) Textile industry and management – introduction, concepts mill management – production, material, financial, marketing management. Feasibility study and Industrial safety.

9) Calculations regarding all processing mentioned above.
ARCHITECTURAL ENGINEERING


Building Construction: Foundations. Footings, Walls, Lintels, Carpentry & Joinery, Openings (doors & windows), Composite Masonry, Partition Walls, Staircases, Cladding, Sloping and flat roofs, Floorings, Structural steel work and Types of steel trusses

Architectural Drawing & Graphics: Importance of Scale, Different forms, Architectural representation of different objects, Solid geometry, Building Geometry – isometric, axonometric, etc., Types of Arches, Sciography, Perspectives, Rendering, visualization skills and importance of free hand drawing.

Engineering Mechanics: Simple stress and strain, Types of stresses, elastic limit, modulus of elasticity, Bending moment and shear forces, Moment of inertia, Deflection, Buckling & Crushing failures, Slenderness ratio, Torsion, Design of RCC & Steel Structures.

Introduction of art and architecture: Importance of art, Development and exploration of art, Relationship between art and architecture, Role of an architect in society, relationship with other consultants, Technical knowledge and expertise, Evolution of Shelter forms.


Water supply and Sanitary Engineering: Sources of water supply, Quality of water, Treatment of water, Distribution system of water, Collection and Treatment of refuse, Sewage, Principles of drainage, plumbing and Sanitary fittings and fixtures, Roads & Pavements.


Landscape design and site planning: Importance and role of landscape designing, Historical Perspective, Elements in Landscape design, Plants and design, Landscape construction.


Sociology of Human settlements: Sociological aspects, Elements of society, Urbanization, Historic Evolution, Transportation and communication, Principles of ekistics.

Economics, Estimating and Costing: Introduction on economics, Micro and Macroeconomics, economic issues, Financing of a project, Quantity surveying and estimating (approximate and detailed) and rate analysis.

Town Planning: Town forms in urban planning and development processes, various levels of planning: national, regional, urban, rural, local etc., objectives of town planning, O-D surveys, F.S.I. planning of industrial and recreational areas, urban renewals, TCPO and Town planning organization in India.

Building Acoustics: Need to study acoustics, history of acoustics, generation, propagation, transmission of sound, characteristics of sound, sensibility of human ear, resonance, reverberation time, sabine’s formula, echoes, principles of acoustical design process and sound isolation.

**Professional Practice:** Types of offices for practice, COA registration and rules, IIA Code professional conduct, architects duties, principles of Indian contract act, Tenders, Contracts, Easements, Arbitration, Valuation, Role of Consultants, Building Bye-laws, National Building Code, Consumer protection act, transfer of property.

**Computer Applications:** Hardware and Software requirements, Operating systems, Features of presentation package, drafting packages and benefits of Internet technology.
CHEMICAL ENGINEERING (PETRO-CHEMICALS)

I. CHEMICAL ENGINEERING:


3. Mass Transfer: Molecular diffusion in fluids, mass transfer coefficients, Distillation (binary system), gas absorption, drying and liquid extraction operations.

4. Reaction Engineering: Rate of reaction, variables affecting the rate of reaction. Interpretation of kinetic data in batch and flow systems. Theories of reaction rate, classification of reactors, design equations for batch and flow reactors.


8. Material and Energy Balances: Basic calculations, Material balances with and without chemical reactions, energy balances, combustion.


II. ELECTIVE/SPECIALIZATION: PETRO-CHEMICALS

1. Origin of petroleum.
2. Natural Gas: Composition application as fuel.
4. History of petrochemical industry and alternative sources.
5. Characteristics of petrochemical manufacture. Techniques involved Naphtha cracking, alkylation, isomerization and polymerization to produce petro-chemicals.
6. Petro-chemicals and their application.
7. Classification of petro-chemicals according to source
   a) Ethylene derivatives
   b) Derivatives of higher paraffins
   c) Propylene derivatives
   d) Derivatives of C4 hydrocarbons
   e) Derivatives of higher olefins
   f) Derivatives of aromatics
   g) Economic aspects of petro-chemical industry in India.
CERAMIC TECHNOLOGY

FUELS, FURNACES & PYROMETRY:

A. FUELS:

1. **Solid Fuels:** COAL: Coal formation theories, Mineral matter, Classification, handling and storage, washing, general properties, Calorific value, grind ability etc.

2. **Gaseous Fuels:** Various gaseous fuels like Producer gas, Water gas, Coke Oven gas, other gaseous fuels like blast furnace gas, LPG, CNG, Natural gas – Properties like composition, calorific value.


4. **Properties:** Analysis of coal, gaseous fuels, liquid fuels.

B. FURNACES:


2. **Heat Transfer:** Heat transfer to charge by conduction, convection and radiation, flow of heat through furnace walls, heat losses, heat balancing, heat recovery – recuperators and regenerators.

3. **Types of furnaces:** Various types of furnaces and kilns used in ceramic industries

C. PYROMETRY:


CERAMIC SCIENCE

1. **CRYSTAL CHEMISTRY:** Ionic bond with examples – Potential energy curve-bond strength – Lattice energy – Covalent Bond – Atomic and molecular orbitals, hybridization – Metallic bond – Vanderwall’s bond – Hydrogen bond, Mixed bond. Relation to bond vis-à-vis melting point, hardness, electrical and thermal properties – Crystalline defects; Point defects, line defects.

2. **PHASE EQUILIBRIA AND PHASE DIAGRAMS:** Gibb’s rule and its interpretation; condensed system – One component system – Binary diagrams – Lever rule – Familiarity with SiO₂ – Na₂O, CaO – Al₂O₃, SiO₂ – Al₂O₃ – Ternary phase diagrams - Na₂O, CaO - SiO₂, CaO - Al₂O₃, SiO₂, MgO – CaO – SiO₂.


5. **OPTICAL PROPERTIES:** Reflection and refraction – Scattering and opacity, absorption and radiation – Ionic colour in vitreous systems – Colloidal colours – Carbon – Sulphur

6. **CHEMICAL PROPERTIES:** Surface chemistry of vitreous materials – attack of water, alkalies and acids, electrode glasses, durability of glazes and enamels.

GLASS TECHNOLOGY

INTRODUCTION: Glass industry in India – common uses – import and export of glass, present and future status.

PREPARATION OF GLASS BATCH: Glass composition – melting and fabrication, characteristics, properties and cost; composition range.

MAJOR INGREDIENTS: Sand, Limestone, Dolomite, Soda ash, Feldspar, Nephelene syenate etc.

MINOR INGREDIENTS: Melting accelerators, Refining agents, docoulourisers.

CULLET: Cullet and its use- BATCH calculations


FABRICATION PROCESSES: Conditions of glass; feeding; blowing and pressing – effect of variations in composition on the working characteristics

ANNEALING & TEMPERING: Release of stress, annealing constant, determination of annealing schedules for slabs, continuous plate containers, tempering.

TESTING & QUALITY CONTROL: Raw materials; Sieve analysis; purity, batch analysis, density, composition and homogeneity, SQS chart, softening point and thermal expansion. Defects in Glass; seeds and blisters, cords, strie, strain and stones, methods of testing, sources of trouble and their elimination. Fabrication defects; various defects of fabrication. Testing of container; weight and capacity, flat glass.


BATCH PREPARATION: Handling, mixing and charging of raw materials.


POT MELTING PRACTICE: Types of glasses suitable for pot melting, pots and pot furnaces.


ENAMELS


WHITEWARE AND HEAVY CLAYWARE


CHANGES DURING FIRING: Thermal decomposition – changes in ceramic body – sintering – microstructure


REFRACTORIES

CLASSIFICATION: Classification of Refractories – Acid - Basic – Neutral – Special Refractories


REFRACTORY INDUSTRY: Status and scope of Indian Refractory industry – Lay out of modern Refractory plant.


CEMENT TECHNOLOGY

CEMENT INDUSTRY: Indian and A.P. scenario – Large – medium – small scale units.


SPECIAL CEMENTS: Rapid setting cement, Pozzolona, Slag cement etc.

SPECIAL CERAMIC MATERIALS


**SEMI CONDUCTORS:** Germanium – Silicon – Gallium – Antimonide – Silicon carbide etc.


**NUCLEAR CERAMICS:** Methods of production and properties – Uranium Oxide; Uranium carbide, Thorium Oxide; Beryllium Oxide etc.
MATHEMATICS


PHYSICS

I. Mathematical Physics:


II. Classical Mechanics:


III. Electromagnetic Theory:


IV. Special Theory of Relativity:


V. Statistical Mechanics:


VI. Quantum Mechanics:

Schrödinger’s wave equation – Born interpretation of wave functions – Expectations values of dynamical variables – Ehrenfests’ Theorem - Uncertainty Principle – Application of Schrödinger’s equation to (a) One dimensional squarewell potential (b) Simple harmonic Oscillator (c) Hydrogen atom.


VII. Electronics:


VIII. Solid State Physics:

Crystallography – Classification of solids – Point group and space group – Crystal systems – Specification of planes and directions – Elements of X-ray diffraction – Various crystal bindings – Metallic, ionic, co-valent
molecular and hydrogen bonded crystals – Band theory of solids – motion of electrons in periodic potential
Block’s theorem Kronig’s penny model – energy bands – Brillouin zones – distinction between insulators –
Metals and Semi-conductors on band theory.

IX. Nuclear Physics:

Radioactivity, Chain dis-integration, transient and secular equilibrium – Age of rocks and Radio carbon
dating – alpha decay or Gamow’s theory – Beta decay and neutrino Interaction of gamma rays with matter –
Selection rules – nuclear models – Liquid drop model – semi empirical mass formula – criteria for stability
against spontaneous decay – Shell model – nuclear detectors – Ionisation – Chambers – G.M. counters –
Proportional counters – bubble and spark chambers – Semi-conductor detectors.

X. Spectroscopy:

Bohr – Sommerfield theory of Hydrogen atoms – Space quantisation – fine structure of spectral lines – Alkali
spectra – Zeeman effect Vector atom model of one electron system – Paschen – Back effect – Stark effect
in Hydrogen atoms – Band spectra – Types of band spectra-I.R. and Raman effect. Isotope effect – Franck
– Candon Principle.
Detailed Study of literary age (19th Century) viz.,

The period of English Literature from 1798 to 1900 with special reference to the works of the major writers including Wordsworth, Coleridge, Byron, Keats, Shelley, Lamb, Hazlitt, Thackeray, Dickens, Tennyson, Browning, Arnold George Eliot, Carlyle and Ruskin.

Study of the following Texts:

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<th>No.</th>
<th>Author</th>
<th>Texts</th>
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<tr>
<td>2.</td>
<td>John Milton</td>
<td>‘Paradise Lost’, -Books I &amp; II</td>
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<td>3.</td>
<td>Alexander Pope</td>
<td>‘The Rape of the Lock’</td>
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<td>5.</td>
<td>John Keats</td>
<td>‘Ode to a Nightingale’</td>
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<td>6.</td>
<td>P.B. Shelley</td>
<td>‘Ode to the West Wing’</td>
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<td>7.</td>
<td>Jane Austen</td>
<td>‘Pride and Prejudice’</td>
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<td>8.</td>
<td>Charles Dickens</td>
<td>‘A Tale of Two Cities’</td>
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<td>9.</td>
<td>Thomas Hardy</td>
<td>‘The mayor of Casterbridge’</td>
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<td>13.</td>
<td>Mulk Raj Anand</td>
<td>‘The Big heart’</td>
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COMMERCIAL AND COMPUTER PRACTICE
(To teach Commerce and English Type writing & Shorthand)

01. FINANCIAL MANAGEMENT:
Corporation Finance – Economic and Managerial Aspects – Finance Education.
Internal Financial Control – Ratio Analysis – Break-even Analysis – Sources and uses of funds statements.

02. INDUSTRIAL ORGANISATION:
Concepts of Industry, Firm and Plant.
State and Industry – Operational Control over Private Industry.

03. LABOUR ECONOMICS AND INDUSTRIAL RELATIONS:
Labour in Industrial Society – Man Power Problems of under developed countries.
Economics of the Labour Market – Factors affecting supply and demand for labour – Concepts of full employment, unemployment – Different types of unemployment – Causes – effects and remedial measures, labour mobility – Absenteeism and turnover.
Tripartite bodies in Industrial Relations.

04. MANAGEMENT:
Planning – Business Objectives – Social responsibilities of business.
Authority, Power, Influence and the art of delegation. Span of Supervision.
Line and Staff relationships.
Bases and problems of departmentation.
Centralisation and Decentralisation.
Bureaucracy – Committee Management.
Top management functions and the role of the Board.
Control functions in organisations.
Group dynamics.
PHARMACY

I.
i) History of Pharmacy: Code of ethics in Pharmacy, Poscology; Principles of dispensing of mixtures, emulsion, powers and suppositories; Different types of Incompatibilities.

ii) Pharmacy Act; Drugs and Cosmetics Act and Rules; Drugs price control order including amendments.

iii) Methods of Sterilization and test for sterility; Preparation of vaccines, Sera and Anti-toxins; Manufacture of Penicillin and Streptomycin.

iv) Methods of classification of crude drugs; Adulteration and evaluation of crude drugs.

v) Pharmacognosy of Senna, Digitalis, Ispaghula, Cinchona, Cinnamon, Renwoflia, Podophyllu, Ergot Cod liver oil and Gelatin.

vi) Principles, instrumentation and applications of colorimetry. Spectrophotometry, fluorimetry, gas chromatography and High performance liquid chromatography.

II.
i) Theory and applications of rheology (Newtonian and Non-Newtonian); Colloidal and interfacial phenomenon and their applications; Coarse dispersion (emulsions and suspensions)

ii) Physics-Chemical, formulation and biological factors effecting drug absorption.

iii) Formulation, technology and qualify control of tablets, capsules, liquid crias, aercsols, creams and ciments, injectables and sustained telease medicaments.

iv) Structure activity relationship, synthesis, chemical nomenclature and uses of following classes of drugs – dypnotics and Sedatives; trauquilizers; Analgesics and Autipyretics; Anti-inflammatory drugs; Diuretics; anti-hypertensives and Chemotherapeutic Agents.

v) Pharmacology of Local anesthetics; Diuretics; Hormones; Hypeglyeemic agents; Anti-histaminics; Drugs acting on central pervious system; Adrenergic and Cholingrgic drugs and Cardio-vascular agents.

vi) Pharmacokinetic and Pharmacodynamic drug interactions with suitable examples; Terratogenicity; Drug-induced diseases.
1. **SUGAR MANUFACTURING PROCESS:** Juice extraction - Clarification, evaporation - Pan boiling, Crystallization - Centrifugation, drying and grading - Chemicals used in sugar industry.

2. **SUGAR - TECHNOLOGY:**
   i. **MILLING CONTROL:** Mill Extraction - Reduced mill extraction, Analysis of mill performance - Calibration of vessels.
   ii. **BOILING HOUSE CONTROL:** Boiling house extraction - Reduced boiling house extraction, balances - importance of Chemical control.
   iii. **BY PRODUCTS OF SUGAR INDUSTRY:** Bagasse - Molasses - Filter cake.
   iv. **WASTE WATER TREATMENT:** Primary treatment of wastewater, sugar mill wastes - Breweries, wineries and distillery wastes.

3. **SUGAR-ENGINEERING:** Cane unloading equipment - Cane carrier and preparatory devices - Mills - Boilers - Clarification equipments - Evaporators - Pans and condensers - Crystallisers - Centrifugal - Driers and graders - Packing and storing, Spray pand - Storage vessel.

4. **INSTRUMENTATION AND PROCESS CONTROL:** Elements of instrumentation - Principles and operation of instruments used for measuring process variables such as temperature, pressure and vacuum, liquid level, density, viscosity, composition-process instrumentation-process control.

5. **CHEMICAL PROCESS PRINCIPLES:** Process engineering - Laws of conservation of mass and energy, gas laws, vapour pressure, humidity and saturation. Material and energy balances.

   **THERMO PHYSICS:** Heat capacities of gasses and gas mixtures, enthalpy changes during phase transfers.

   **THERMO CHEMISTRY:** Heats of formation, combustion and reaction.

   **THERMO DYNAMICS:** First and second law, ideal gas law, equations of state, phase equilibrium-simple concepts and equations for vapour - Liquid equilibria - Equilibrium constants - Temperature and pressure effects and conversion.

6. **CHEMISTRY AND SUGAR CANE AGRICULTURE:** Chemistry of aliphatic and aromatic compounds - Solutions - Chemical kinetics - Colloids and emulsions. Composition of cane and cane juice - Principle of polarimetry. Sugar cane cultivation - Sugar cane pests and diseases - Nutrition of sugar cane.

7. **FLUID MECHANICS:** Fluid statics, Neutonian and non-neutonian fluids, macroscopic energy balance, continuity equation, Bernoulli’s equation, Dimensional analysis, flow through pipe line systems, flow meters, pumps and compressors. Flow through packed and fluidized beds.


9. **MECHANICAL UNIT OPERATIONS:** Size reduction and size separation. Free and hindered settling, Filtration, mixing and agitation. Conveying and storage of solids.

10. **MASS TRANSFER OPERATIONS:** Fick’s laws, mass transfer coefficients, Film, Penetration and surface renewal theories. Reynold’s and Colburn analogies, Continuous and stage-wise contacting and stage efficiencies principles, design and operation of equipment's for distillation, absorption and leaching.
PACKAGING TECHNOLOGY

01. Definition – Packaging criteria, appearance, protection, cost etc., - Organisation of packaging functions.

02. Role of colors and typography – Role of package shape – Product package relationship – Cost effectiveness – Cushioning design.

03. Properties and applications of paper, board and corrugated board – Metal and foils, glass and wood – Plastics and films – Adhesives and cushioning materials.

04. Introduction to moulding, thermoforming etc., - Varnishing, metallising, laser marking, electroless and electrolytic plating.
Sealing: Dielectric heat-sealing, thermal sealing and different sealing equipment’s – Cushion manufacturing.

05. Aseptic packaging and biological aspects – Aerosol packaging: properties of propellants, valve, filling methods etc., - Different forms of plastics and laminate package.

06. Computer aided designing – Die designing, punching, laser die cutting – Cartooning and labeling systems.

07. Raw materials testing: Surface, physical and chemical tests, printibility test.

PLASTICS AND POLYMERS

I. CHEMICAL ENGINEERING:


3. Mass Transfer: Molecular diffusion in fluids, mass transfer coefficients, Distillation (binary system), gas absorption, drying and liquid extraction operations.

4. Reaction Engineering: Rate of reaction, variables affecting the rate of reaction. Interpretation of kinetic data in batch and flow systems. Theories of reaction rate, classification of reactors, design equations for batch and flow reactors.


8. Material and Energy Balances: Basic calculations, Material balances with and without chemical reactions, energy balances, combustion.


II. ELECTIVE/SPECIALIZATION: POLYMERS AND PLASTICS

Introduction – Definition of Polymers, Classification of polymers, Functionality, Polymerization mechanisms – Chain polymerization (Free radical, anionic, cationic and coordination polymerization – Zigger Natta catalyst), step polymerization (polycondensation, poly addition reactions).


Polymerization processes: Bulk polymerization, Solution polymerization, Suspension polymerization and Emulsion polymerization.

Fabrication processes: Injection moulding, Extrusion, Blow extrusion and extrusion blow molding.

Manufacturing Methods of a few common Polymers: LDPE, HDPE, Polystyrene, Polyvinyl chloride, Phenolic resins.

Status of Indian Plastics – Industry with respect to production, location of industries, demand etc.
I. CHEMICAL ENGINEERING:


3. **Mass Transfer**: Molecular diffusion in fluids, mass transfer coefficients, Distillation (binary system), gas absorption, drying and liquid extraction operations.

4. **Reaction Engineering**: Rate of reaction, variables affecting the rate of reaction. Interpretation of kinetic data in batch and flow systems. Theories of reaction rate, classification of reactors, design equations for batch and flow reactors.


6. **Mechanical Operations**: Size reduction, Properties, Handling and Mixing of particulate solids, Mechanical separations, Screening, Filtration, Sedimentation, Conveying and Storage of solids.


8. **Material and Energy Balances**: Basic calculations, Material balances with and without chemical reactions, energy balances, combustion.


II. ELECTIVE/SPECIALIZATION: PETROL-CHEMICALS

1. Origin of petroleum
2. Natural gas: Composition application as fuel
4. History of petrochemical industry and alternative sources
5. Characteristics of petrochemical manufacture. Techniques involved in Naphtha cracking, alkylation, isomerization and polymerization to produce petrochemicals.
6. Petrochemicals and their application
7. Classification of petrochemicals according to source
   a) Ethylene derivatives
   b) Derivatives of higher paraffins
   c) Propylene derivatives
   d) Derivatives of C4 hydrocarbons
   e) Derivatives of higher olefins
   f) Derivatives of aromatics
   g) Economic aspects of petrochemical industry in India.
MINING ENGINEERING

1. GEOLOGY: Structural Geology: Definition and scope. Recognition of faults, folds, joints, unconfirmaties etc., Primary and induced structures, their importance in Mining, Bedding, Liniation, foliation, fracture, Cleat etc., field Geology; importance and scope of filed Geology, field techniques, geological mapping. Use of survey equipment.


4. EXPLOSIVES AND BLASTING: Classification, types and use of explosives storage and transport. Blasting techniques in UG and open cost mines.

5. SUPPORTS: Objectives, limitations of mine supports, Types of mine supports and systematic timbering.


7. METAL MINING: Scope and limitations of U/G mining methods, Classification of U/G metal mining systems and their applications in different conditions.


10. MINE ENVIRONMENTAL ENGINEERING: Mine air and environment. Natural and mechanical ventilation, Types, design variables, selection, installation and maintenance. Mine fires, explosions and inundations, Rescue and recovery.

11. MINE LEGISLATION AND SAFETY: Regulations pertaining to conservation's, exploitation of mineral deposits. Safety welfare and hygiene of mine workers.