

TNPSC Combined Engineering Services Syllabus

ANNEXURE-I

PAPER-I

Syllabus

[The existing syllabi for the subjects under Paper-I now (previously Paper -I and Paper –II) have been clubbed together and constituted as a single syllabus]

CIVIL ENGINEERING

Degree Standard

PAPER-I

Code No: 029

UNIT I

CONSTRUCTION MATERIALS Engineering Properties uses and tests for stones and bricks lime - sources, types and properties - cement - composition, tests, specifications, properties - types of cements and admixtures. Miscellaneous materials - Glass, Rubber Plastics and materials for acoustics and insulation.

UNIT II

CONSTRUCTION PRACTICE Stone Masonry - Classification, construction details and supervision - Brick Masonry - bonds - Damp proof courses - construction details of walls and arches. Shoring, scaffolding, underpinning. Floor finishes and roof coverings. Stairs and stair cases - Layout - types - suitability, Doors, Windows and ventilators Types - Selection, Fire resistant structure.

UNIT III

ENGINEERING SURVEY Levelling - Types - LS and CS contouring calculation of areas and volume Theodolite survey - Traversing - Heights and Distances Tacheometry - Modern surveying instruments. Setting out of curves Permanent adjustments of levels and theodolites.

UNIT IV

ESTIMATING AND COSTING Types of estimates - Writing technical specifications and tender documents. Types of contracts - terms and conditions conflicts and arbitration - Rate Analysis - schedule of rates Valuation and Rent fixation.

UNIT V

STRENGTH OF MATERIALS Stresses and strains - Elastic constants, - shear and tension compound stresses principal stresses and planes Theories of failure. Theory of simple bending - shear stress - distribution in beams Deflection of beams Strain energy in elastic deformation, impact fatigue and creep.

UNIT VI

THEORY OF STRUCTURES Proposed cantilever and fixed beams Continuous beams - Theorem of three moments - portal frames - moment distribution method - Columns - short & long columns, unsymmetrical sections. Euler's theory - critical loads for different end conditions Analysis of arches - Eddy's theorem - suspension bridges /moving loads - influence lines. Domes and Retaining walls - stability conditions - checking.

UNIT VII

SOIL MECHANICS Site Investigation and Soil sampling - classification of soil Engineering properties of soil - SPT and its interpretation soil - Water interaction - permeability, seepage shear strength of soils - Determination of C and ϕ Stress distribution in soils - Boussinesq's and Westergaard's. Theory of consolidation - consolidation test. compaction of soils - Moisture density relationship - stability of slopes analysis.

UNIT VIII

FOUNDATION ENGINEERING Shallow Foundations Bearing capacity Theory - Settlement analysis Methods of improving - bearing capacity and minimising settlement - Types of footings - Design principles mat foundations. Deep foundations - Piles - Static and Dynamic formulae - Pile cap - group of piles - pile load test. Retaining walls - Earth pressure theories.

UNIT IX

WATER SUPPLY & TREATMENT Estimation of water resources - Ground water hydraulics for forecasting demand hydraulics. Forecasting demand - Impurities of water - physical, chemical and

bacteriological analysis - water born diseases - pumping and gravity schemes - Water treatment plants chlorination.

UNIT X

SEWAGE TREATMENT & POLLUTION CONTROL Disposal of sanitary sewage - sewer systems - design flow for separate, stern and combined systems - sewer design sewer Appurtenances - Sewage pumping - Types of pumps. Sewage Treatment primary , secondry and tertiary levels plants - Sludge treatment and disposal Industrial watches Rural sanitation - Air pollution - Solid waste management.

PAPER -II

UNIT I

CONCRETE TECHNOLOGY RC Tests on cement and aggregates - High grade cements High strength concrete Testing of fresh and hardend concrete - Non destructive testing - Concrete mix design - IS method quality control - cetering and shuttering sheet piles - slips and moving forms. Coincrete hollow block masonry Construction joints.

UNIT II

DESIGN OF R.C. ELEMENTS Methods of design of concrete members. Limit state and working stress design Design of flexural members. Design of singly and doubly reinforced rectangular and flanged Design of slabs and columns R.C. footings

UNIT III

MISCELLANEOUS STRUCTURES Steel structures - welded connections - Design of tension and compression members - trusses Design of purlins - Design of steel columns & beams. Design and construction of prestressed concrete beams - Design of masonry Chimneys and stacks.

UNIT IV

WATER RESOURCES ENGINEERING Water Resources in Tamil Nadu Water Resource Planning . Master Plan for water. Water budget & Development Plan. Reservoir planning & Management. Flood control. Chennel improvement Land Management.

UNIT V

IRRIGATION ENGINEERING Soil Plant Water Relationship - Water requirement of crops - Irrigation methods. Irrigation efficiencies. Water logging & consequences - Salinity & alkalinity. Reclamation. Head works and distribution works. Cross drainage works.

UNIT VI

TRAFFIC ENGINEERING Traffic Engineering and Traffic surveys - Intersections, road signals and markings - grade separations - parking & traffic control - Traffic regulation & safety. Accident investigation - measures for accident reduction. Traffic Management

UNIT VII

HIGHWAY ENGINEERING Highway planning in India - Road classification - Geometric design of highways. Construction of Earth WBM, bituminous and concrete roads - Design of flexible and rigid pavements. Design of joints in cement concrete roads - Drainage of roads - Maintenance of Roads.

UNIT VIII

RAILWAYS AIRPORTS AND HARBOURS Details of components of permanent way - geometric design - points & crossing - signalling Interlocking and level crossings. Airport planning Components of Airport - Site selection - Airport zonin g - planning of terminal buildings. Harbours & Ports - types - com ponents & their functions - Layout of a harbour - Docks - Wet and dry - Break waters.

UNIT IX

PROJECT MANAGEMENT Construction Management - Inportance and scope. Construction planning scheduling and monitoring - Cost control Quality control and inspection Network analysis by CPM and PERT - Determination of Critical path & floats - Project Management using CPM/PERT

UNIT X

COMPUTER APPLICATIONS Types of computers - components of moder computer systems - Office Automation - Word processing, spread sheets and database management - Developing Flow charts for solving Engineering problems - Computer Aided Design and drafting - Advantages of Computer Aided drafting over traditional drafcting - Developing 2D, 3D drawings and solid modelling.

ELECTRICAL & INSTRUMENTATION ENGINEERING

Degree Standard

1. **FUNDAMENTALS OF ELECTRICAL ENGINEERING** Dc And Ac Series And Parallel Circuits - Kirchhoffs Law - Network Graph - Matrix Representation - Solution Of Steady State, equations - transients in AC networks - Network theorems, super position, reciprocity, Thevenin and Norton's theorems, Maximum power transfer theorem, star delta transformation - frequency response of RL, RC, RIC series and parallel circuits - solutions of balanced and unbalanced 3 phase circuits.
2. **ELECTRICAL MACHINES** Constructional features of DC Machines, emf equation and characteristics of different types of DC generators - DC motor - torque equation - DC motor characteristics - starters of DC motors speed control of DC motors - testing of DC motors - alternators - different types - constructional features - emf equation - regulation of alternators by different methods - phaseor diagram - expression for power developed as a funtion of torque angle - synchronous motors - principle of operation - v and inverted v curves - starting methods - stepper motors - principle of operation - polyphase induction motors - principle of operation phasor diagram and equivalent circuit - starting and speed control - single phase ixluction motor - principle of opetation and applications - transformers - principle of operation and construction of types different of single phase and three phase transformers - regulation,efficiency and all day efficiency.
3. **CONTROL SYSTEMS** Open loop and closed loop systems - mathematical modelling of physical systems - electrical, mechanical, electro mechanical, hydraulic, pneumatic and thermal systems - transfer function and state space modelling of these systems - block diagram representation and signal flow graph - electrical analog - time response of simple system for impulsee, step and ramp type of inputs - solution of state equations - STM - time domain specifications - frequency domain analysis - polar, inverse polar, bode - constant M and N circles and Nichols chart frequency domain specifications - Routh-Hurwitz stability criterion - Nyquist stability criterion - construction of root locus - determination of closed loop poles - transient response and stability from root locus
4. **GENERATION TRANSMISSION AND DISTRIBUTION** Sources of energy - power plants - hydroelectric - nuclear - thermal - layout - storage schemes - turbines - hydroelectric and steam - interconnected systems - cost evaluation - nuclear reactors - fuel materials - coolant - comparison and detection of different types of power plants - transmission lines - performance - short and medium - corona - insulators - transmission towers - underground cables - distrubution - feeders - distributors and service main - comparison of distribution system - radial and ring distributors - calculation of voltages and distributors with concentrated and distributed loads.
5. **PROTECTION AND SWITCH GEARS** Circuit breakers - Arc in oil - Arc interruption - theories - current chopping - oil circuit breakers - air blast circuit breakers - vacum circuit breakers - sulphur hexaflouride - circuit breakers - testing of circuit breakers - protective relays - functional characteristics of protective relays - operating principles of relays - overcurrent relays - directional over current relays - the universal relay - torque equation - differntial relays - feeder protection - distance protection - generator protection - protection of transformers - carrier current protection - comparators - static relays - fuses and H.R.C.fuses for relays (the emphasis must be on solid state devices).
6. **BASIC ELECTRONICS** Semi conductor diodes - zener diodes - transistors - FET's power diodes - thyristors - photocell - photodiodes - power diodes - photo transistors,L.D.R.and applications - rectifiers and voltage regulators - amplifiers - classification of amplifiers - power amplifiers - wide b and amplifiers - oscillators - operational amplifiers - application of operational amplifiers - Indusstrial timers - voltage regulators - Instruementation amplifiers - A to D and D to A converteros - PLL - active filters.
7. **DIGITAL TECHNIQUES** Number systems used in Digital electronics -weighted binary codes - non weighted codes - crror detection and correction,alpha numeric codes,BCD- development of Boolean algebra - truth fuctions - reading boolean expression - Boolean expansions and logic diagrams - Minterms - tables and maps - solving digital probleme - Map reduction techniques - sum of products from hybrid function - multiple out put minimizations - tabular minimisations - sequential logic - flip/flops - digital counter - ripple counter - logi c gates - mutliplexers, demultiplexers and decoders , code converters - arithmetic funcrions - shift registers - semi conductormemory elements - PLA.
8. **NETWORK ANALYSIS** One port and two port networks - driving point impedance and admittance of one port network - open circuit impedance and short circuit admittance of two port network - transfer impedance and admittance - A,B,C,D parameters - impedance matching - filters - character istic of ideal filters - low pase and High pass filters - attenuation and phase shift - bandpass filter - elements of network synthesis - realiability of one port, hurwitz polynomical positive real function - necessary and sufficient conditions for positive real function - testing a positive real function properties - synthesis of RL RC and LC driving point impedances.

9. ELECTRICAL MEASUREMENTS Measurement of voltage and current - permanent magnet moving coil and moving iron meters - dynamometer type - thermocouple and rectifier type; instrument of power and energy - dynamometer type wattmeter and induction type energy meter - single phase and three phase - testing and calibration of energy meter - power factor meter - magnetic measurement - ballistic galvanometer and fluxmeter - BH curve - permeability measurement - current and voltage transformers - use of instrument transformers with wattmeters - KVA and KVAR meters - maximum demand indicators - Megger.
10. ELECTRONIC MEASUREMENTS BJT, FET and MOSFET voltmeters - solid state multimeter - DMM - audio and Radio frequency signal generators - AM signal generator - function generator - wave analyzer - spectrum analyser - frequency measurement - measurement of period and time - phase angle measurement - bridge type of measurements - recording instruments - display instruments - general purpose oscilloscope - multitrace display - digital storage - sampling oscilloscope - synchroscope.

PAPER -II

1. MEASUREMENT SCIENCE Static characteristics of measuring instruments - accuracy, precision sensitivity, non-linearity, hysteresis - dynamic characteristics - I order and II order instruments - Standards and calibration - errors and error analysis.
2. TRANSDUCERS Variable resistance transducers - potentiometer, strain gauge RTD, thermistor, hygrometer - Variable inductance transducers - LVDT - variable reluctance accelerometer - variable capacitance transducers for differential pressure, sound and thickness measurement - piezoelectric transducer - smart transducers.
3. MECHANICAL MEASUREMENTS Characteristics of instruments for measurement of displacement, velocity, acceleration, force, torque and vibration.
4. INDUSTRIAL INSTRUMENTS Temperature measurement - thermocouples, cold-junction compensation for thermocouple, radiation and optical pyrometers - pressure measurements - bourdon gauge, bellows, diaphragm, differential pressure transmitter, vacuum gauges, manometer gauge, Pirani gauge - flow measurement - orifice meter, venturimeter, electro magnetic flow meter, ultrasonic flow meter, rotameter positive displacement meters, mass flow meters.
5. ANALYTICAL INSTRUMENTS Measurement of pH, viscosity and density - Gas chromatography - UV and IR spectrophotometers, single beam and dual beam spectrophotometers.
6. PROCESS CONTROL Basic control actions - on - off, P, I, D, P + I, P + D and P + I + D control actions - electronic and pneumatic controllers - feed forward control, ratio control and cascade control - control valves - computer control of process - z transforms.
7. BIO MEDICAL INSTRUMENTS Measurement of biological signals - ECG, EEG, EMG - blood pressure and blood flow measurements - defibrillators - pace maker.
8. TELEMETRY Wired telemetry - Radio telemetry - analog modulation - time division multiplexing and frequency division multiplexing - PAM and FM transmitters - digital modulation - PCM transmitters - Demultiplexing - receivers - fibre optic transmitters and receivers.
9. MICRO PROCESSORS AND MICRO CONTROLLERS 8 bit microprocessors - 8085 and 8080 - Architecture, programming and interface devices - 16 bit microprocessor 8088 - Micro controllers, 8031 and 8051 Microprocessor based instruments.
10. LOGIC AND DISTRIBUTED CONTROL Direct digital control - supervisory control - SCADA - programmable logic control - I/O module, PLC programming, ladder diagram - distributed control system - configuration, operator station, displays, communication in DCS, protocols, field bus.

MECHANICAL AND PRODUCTION ENGINEERING

(Mechanical Engineering)

Degree Standard

PAPER-I

Code No: 074

1. APPLIED MECHANICS: Statics of particles - Resolution of forces - supports and reactions - Determination of forces in member of statically determinate plane trusses by method of joints and method of section. Controls - moment of inertia, position, velocity and acceleration of particles. Newton's Second law, Equations of motion, principle of work and energy, impulse and momentum, impact of elastic bodies, friction - laws, simple machines.
2. ENGINEERING THERMODYNAMICS:- Energy - Work - heat properties - states - processes. Energy equations. Work and PV diagrams. Laws of thermodynamics Carnot cycle, reversed Carnot cycle, efficiency - COP. Specific heats - gas laws - perfect gas relationships. mole concept, molar volume, internal energy, enthalpy, molecular weight of gas mixtures. Methods of cycle analysis - tables of thermodynamic properties of air - thermal efficiency Otto cycle - diesel cycle - dual combustion cycle - comparison of cycles - problems on use of steam tables.

3. INTERNAL COMBUSTION ENGINES:- Basic engine nomenclature - engine classification - working of SI engine, CI engine, two stroke engine and four stroke engine - carburation - air fuel mixture ratio. Combustion in SI engine - ignition systems - timing - spark plugs - combustion chamber. Combustion in CI engine - ignition delay - valve timing diagram - fuel supply injection systems. Performance of SI and CI engines - factors affecting the performance characteristics. Cooling - lubrication systems, fuels used in SI and CI engines. Measurements of engine power - indicated mean effective pressure - indicated horse power - brake horse power - specific fuel consumption - thermal efficiency.
4. GAS DYNAMICS AND JET PROPULSION:- Energy equation for flow process - velocity of sound - mach number - effect of Mach number on compressibility. Isentropic flow with variable area - Area ratio as a function of Mach Number - mass flow rate - flow through nozzles - flow through diffusers. Solution of Fanne flow equation - isothermal flow with friction. Flow with normal shockwaves - governing equations. Prandtl - Meyer equation. Aircraft propulsion - jet engines - energy flow - thrust power and propulsive efficiency - performance of jet engine. Rocket engines - performance - solid and liquid propellant rockets. Comparison of various propulsion systems.
5. REFRIGERATION AND AIR CONDITIONING:- Principles of refrigeration - mechanism of producing cold - types of refrigerations - refrigerating effect and unit of refrigeration - coefficient of performance of refrigerator. Air refrigeration systems - reversed Carnot cycle - Bell coleman cycle. Simple vapour compression system. Advanced vapour compression systems - T.S Diagram - pH chart - dry and wet compression - under cooling. Vapour absorption systems. Refrigerants. Refrigeration applications. Air conditioning - Factors in air conditioning - simple heating and cooling - dehumidification - humidification.
6. FLUID MECHANICS:- Classification of fluids - fluid properties - Ideal fluid flow - Rotational - irrotational flow - Bernoulli's equation - Flow through pipes - pipes in series - pipes in parallel - DARCY'S equation - viscous fluid flow - Navier - stokes equation - Laminar and Turbulent flow - Reynold's number - Compressible flow of perfect gas - speed of sound wave - concept of Mach number - Hydraulic Jump.
7. TURBOMACHINERY:- Definition and classification of turbo machines, equation for energy transfer. Centrifugal fans, blowers and Compressors. Axial flow fans and compressors. Axial turbine stages. Free and forced vortex flow. Centrifugal pumps - workdone - head - specific energy - priming - performance of multistage pumps. Hydraulic turbines - different types - governing, performance - selection of turbines. Gravitation - method of preventing - hydraulic coupling - torque convertors.
8. HEAT AND MASS TRANSFER:- Modes of heat transfer, one dimensional heat conduction, resistance concept, unsteady state heat conduction. Fins, free and forced convection. Thermal boundary layer concept. D.B. equations and other correlations, radiation, black and gray bodies, shape factor design of heat exchangers. NTU method. Analogy of mass, Heat and Momentum transfers, mass transfer equipments.
9. POWER PLANT ENGINEERING:- Sources of energy - conventional and non - conventional Location of steam power plant, diesel power plant and nuclear power plants - layout. Disposal of waste, safety and hazards. Hydroelectric power plants, Gas power plants - environmental problems. Power plant economics, cost benefit analysis - future power plants wind, tidal, solar energy - problems and prospects. Geothermal energy, fuel cells, thermionic and thermo electric converters etc.
10. INSTRUMENTATION AND CONTROL:- Elements of measurement systems. Range, span, sensitivity, accuracy, precision and repeatability of instrument. Errors in measurement system. Transducers for measurement of pressure, manometers, temperature measuring instruments, measurement of speed, strain gauge basics, force measurement using load cells and electromechanical methods. Dynamometers for power measurement, flow meters, rotameters, using velocity process, hot wire anemometer, accelerometers. Open and closed loop control systems. Transfer function, Hydraulic and Pneumatic control systems, Different types of controls like, two way proportional, differential and integral control.

PAPER-II

1. STRENGTH OF MATERIALS:- Direct stress and strain – elasticity – Hook's law – Poisson's ratio – bulk modulus. Shear stress- modulus of rigidity. Analysis of stress and strain compound stress. Strain energy, resilience and strength theories. Bending moment and shearing forces.
Bending stresses in beams, shearing stresses in beams, deflection of beam, fixed and continuous beams. Combined direct and bending stresses. Columns and struts, torsion of

- shafts, springs, thin and thick cylindrical and spherical shells. Riveted joints.
2. THEORY OF MACHINES-I:- Kinematics of mechanisms – link pair – Inversions of mechanism four bar chain – slider crank mechanisms. Motion and inertia – velocity – acceleration – force – mass – centrifugal and centripetal force – mass moment of inertia – velocity in mechanism – velocity polygons – acceleration in mechanism – lower pair – cams – gyroscope.
 3. THEORY OF MACHINES-II:- Friction-laws of solid friction-wedge-screws-threads collar-pivot-clutch-bearing. Belt, rope and chain drive-toothed gears-gear trains-inertia force analysis and fly wheel governors – stability – friction and insensitiveness. Balancing of several masses in different planes. Mechanical Vibrations – force vibrations – damping.
 4. DESIGN OF MACHINE ELEMENTS:- Design of riveted and welded joints – Design of detachable joints – Bolted Joints cotter joint – Knuckle joint – Design of crank shaft and connecting rod – Flange coupling – Helical and leaf springs – Fly wheel – Design of journal and thrust bearings.
 5. DESIGN OF TRANSMISSION ELEMENTS:- Selection of flat and vee belts – design of cone pulley belt drive – design of spur gears, helical gears and bevel gears – Design of worm and wheel pair for power transmission – Design of single and two stage speed reducers.
 6. PRODUCTION PROCESSES:- Classification of machining processes, metal cutting tools, tool materials, tool geometry, Lathe; mechanisms for feed and spindle drive, work holding device, types of operation, Drilling machines, shaper, slotter and milling machines; drives and types of work done, milling machines; drives for spindle speed and feed Work holding devices indexing, milling machine operations.
 7. MACHINING PROCESSES:- Grinding machines: Abrasives, grain structure and designation of grinding wheels, various types of grinding, work holding devices. Fine finishing process; honing, buffing, metal spraying and electroplating.
Gear and gear manufacturing; Gear milling, shaping, hobbing, gear finishing: gear shaving, grinding, lapping , and gear honing. Special Machining process; Electro discharge machining, Electro Chemical grinding, electron beam and laser beam machining abrasive jet machining. NC & GNC machine operations, Flexible manufacturing systems automated guided vehicles, FMS layout, material handling system.
 8. METROLOGY AND QUALITY CONTROL:- Precision instruments: Vernier, micrometer, slip gauges, sine bars, comparators, Inter changeability, limit gauges. Profile projector, tool

maker's microscope, screw thread projector, measurement of surface finish, Testing geometric accuracy of machine tools, Errors in threadpitch measurement, gear tooth errors statistical quality control concept, use of control charts, Acceptance sampling, economic aspects of quality control.

9. INDUSTRIAL ENGINEERING:- Work study – techniques – Method study – objectives – basic procedure – work measurement – objectives – basic procedure – production planning and control – machine loading and scheduling – product sequencing – inventory control – E O Q – quantity discounts – ABC Analysis – Plant layout – Product and Process layout material handling systems – simplex method – Transportation model – Assignment model.
 10. INDUSTRIAL MANAGEMENT:-The basic of management theory and practice – Planning – The nature and purpose of Planning – The nature and purpose of Planning – Decision making – Organising – Nature and purpose of organising – staffing – Nature and purpose of staffing – Leading – Motivation – Leadership – controlling – Control techniques – Ensuring effective managing.
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TEXTILE ENGINEERING
Degree Standard

PAPER-I

Code No: 114

UNIT I

FIBRE PRODUCTION :- Classification of textile fibres. Principles of polymerization, Manufacturing details of viscose rayon, Poly ethylene terephthalate, nylon 6 and 6,6, poly-acrylonitrile, poly propylene, polyaramides carbon and glass fibres. Texturization of fibres.

UNIT II

FIBRE COMPOSITES :- Resins, additives to resins. Types and characteristics of the re-inforcing fibres, Different textile structure used for re-inforcements.

UNIT III

SPINNING PREPARATORY PROCESSES :- Sequence of processes used to prepare the staple fibres (cotton, jute, wool and man-made fibres) for yarn spinning. Process optimization.

UNIT IV

CONVENTIONAL YARN SPINNING :- Yarn formation using ring spinning method. Spinning limitations. Doubling of yarns.

UNIT V

NEW METHODS OF YARN SPINNING:- Yarn production by open end, friction and air-jett spinning methods. Techno - economic comparison with conventional method.

UNIT VI

PREPARATORY PROCESSES FOR FABRIC FORMATION:- Sequence of processes used to prepare the yarn for fabric formation in looms and knitting machines. Process optimization.

UNIT VII

WEAVING MACHINES:- Fabric formation in conventional and high speed looms. Process optimization. Economic viability of high speed looms.

UNIT VIII

KNITTING MACHINES:- Fabric production in weft knitting machines. Comparison of woven and knitted fabrics, Principles of warp knitting. Production of garments from woven and knitted fabrics.

UNIT IX

CHEMICAL PROCESSING:- Preparation of material for coloration and finishing, principles involved in dyeing and printing. Physical and chemical finishing operation.

UNIT X

QUALITY ASSESSMENT:- Sampling method, Determination of sample size. Testing of fibres yarns and fabrics for various qualities. Statistical Significance Test.

PAPER -II

UNIT I

STRUCTURAL MECHANICS OF YARN :- Yarn geometry, Fibre migration and its characterization, Prediction of filament and spun yarn tensile behaviour under different conditions.

UNIT II

STRUCTURAL MECHANICS OF FABRICS :- Fabric geometry, Prediction of deformation behaviour of woven, knitted and non - woven fabrics.

UNIT III

TEXTILE MACHINE DESIGN :- Design of Cams, gear trains, clutches and brakes for application in textile machines. Kinematics of comb and loom operations.

UNIT IV

MACHINING OPERATIONS :- Material Selection, Different machining operations. Surface treatments, Tolerance Limits.

UNIT V

PNEUMATICS:- Application of free air and compressed air in textile machinery. Air pressure measurements and its control.

UNIT VI

WORK STUDY:- Work and time measurement. Motion time analysis. Resources allocation and scheduling.

UNIT VII

PRODUCTION PLANNING:- Balancing of textile machines in different departments to produce required quantity of and products taking into account various process parameters.

UNIT VIII

MACHINERY MAINTENANCE:- Break-down and preventive maintenance for textile machines. Types and Selection of Lubricants, Lubrication devices, Depreciation and replacement studies.

UNIT IX

SELECTION OF MOTORS:- Selection of electric motors for various textile machines. Application of variators and invertors. Smooth starting of machines. Microprocessor applications. Power requirements.

UNIT X

ENVIRONMENTAL CONDITIONS IN TEXTILE MILLS:- Plant lay-out, Material handling. Lighting and humidification, Safety devices]

ELECTRONICS & COMMUNICATION ENGINEERING

Degree Standard

PAPER-I

Code No: 044

ELECTRONIC DEVICES CIRCUITS AND SYSTEMS

UNIT I

DEVICES AND CIRCUITS: Diodes and Transistors - PN Point contact Zener, varactor, Tunnel, step recover - input and output characteristics of BJT, FET, UJT, Opto - electronic devices - Biasing and stabilisation of transistor circuits - analysis using h - parameters - calculation of gain, impedance and bandwidth .

UNIT II

AMPLIFIERS AND OSEILLATORS: Design and analysis of RC, Dc coupled, Large signal amplifiers, Differential amplifier and tuned amplifiers - Oscillators - Criteria for oscillation, resonance type oscillators RC Phase shift wein bridge oscillators

UNIT III

RECTIFIERS AND POWER SUPPLIES: Half wave, Full wave and Bridge rectifiers will all types of filters, regulated power supplies. SMPS.

UNIT IV

MULTIVIBRATORS AND A VESHAPING: Astable, Bistable Monostable and submit trigger saw tooth generation using BJT and UJT clipping and clamping circuits using diodes and transistors.

UNIT V

LINEAR AND DIGITAL INTEGRATED CIRCUITS: IC fabrication techniques OPAMPS and its applications A/D and D/A converters, PILL. Wave form generators Voltage regulators, IC Power amplifiers.

UNIT VI

DIGITAL CIRCUITS: Switching algebra, Number systems, Logic gates and circuits, Minimization techniques, Logic families, shift registers, Counters, Multiplexersi Dimultiplexers, semiconductor Memories, LSI, VLSI.

UNIT VII

MICROPROCESSORS: 8 and 16 bit microprocessors and their architecture, Instruction set, Peripherals and Interfacing Microcontrollers Microprocessor based system design.

UNIT VIII

COMPUTER SYSTEMS: Data representation, Elements of high level programming languages (Pascal and C) Data Structures, Computer architecture, processor design, control unit design, Memory organization , I/O system organisation.

UNIT IX

MEASUREMENTS AND INSTRUMENTATION: Electrical transducers and their characteristics, measurement techniques, and related Instrumentation.

UNIT X

MICROWAVE DEVICES AND CIRCUITS: Microwave devices sehotky, PIN diodes, Gunn diodes. Microwave aplifiers and oscillators. Microwaves components microwave measurements.

PAPER-II

COMMUNICATION ENGINEERING

UNIT I AM/FM TRANSMITTERS AND RECEIVERS: AMPLITUDE, FREQUENCY AND PHASE MODULATIONS: Definitions and equations, modulation, index -Frequency spectrum of AM/FM signals, modulators and demodulators - Diode detector, slope detector, Balanced slope detector foster seely discriminator Ratio detector. Transmitters: Allocation of frequency for various services, High power transmitter, Aerial coupling. Receiver: Superbeter odyne, SSB and FM receivers noise considerations. Digital communication: PCM, TDM and FDM.

UNIT II

TRANSMISSIONLINES, ANTENNAS AND WAVE PROBAGATION: Transmission lines and Wave guides: Characteristic impedance of transmission lines, standing waves - matching using smith chart-rectangular and circular wave guides - resorators, isolatored circulators and direction couplers. Antennas: Isotropic radiator, dipole, vertical antenna, resonant and non-resonant antennas - arrays - VHF, UHF, Microwave antennas - radiations pattern for the above antennas. Wave propagation: Ground wave, surface wave, HF and LOS propagation.

UNIT III

ANALOG AND DIGITAL SIGNAL PROCESSING: Signals and systems: Introduction - Vector space - concepts - Representation of signals - Linear time invariant systems - discrete time signals and discrete time systems. Analog Signal Processing: Circuit and Network Theorems, Four Terminal Networks - I, II, Lattice, Bridge - T networks, Equalizers, wave filters, Attenuators. Digital: Linear shift invariant systems - DFT and FFT - FIR and IIR and digitel filters - Design methods, FFT - Wiener and matched filters applications.

UNIT IV

TELEVISION: Television systems and standards: CCIR standards, NTSC, PAL, SECAM system Black and White transmission - scanning, blanking and synchroaising pulses. Monochrome Reception: Common, Video and Sound Circuits, Synchronizing circuits vertical deflection circuits, horizontal deflection circuits. Colour Transmission and Reception: Colorimetry, Generation of RGB signals, compatibility with monochroms TV and with band width, PAL encoding techniques, PAL decoders, colour TV picture tubes, Remote Tuning of TV Receivers.

UNIT V

RADAR SYSTEMS: Radar equations - range, minimum detectable signal, rader cross section, PRF and range ambiguities, Propogation effects and system losses. Types: CW, doppler, FM-CW, MTI, and pulse doppler Radar. Tracking techniques, conical and monopoles, Tracking-in range and tracking in doppler. Radar Transmitter & Receiver: Radar Transmitter source and Modulators, Radar antennas Radar receivers, Duplexers and Displays.

UNIT VI

SATELLITE COMMUNICATION: Orbit and Launch: Equation of Motion, tracking and orbit determination, satellite launches, satellite performance, station keeping, system Co-ordination and control.

UNIT VII

COMMUNICATION SYSTEMS: Satellite sub-system, FSS, BSS, Multiple axes techniques. FDMA, TDMA and CDMA. Earth station configuration, Tracking and receiver sub-systems.

UNIT VIII

FIBRE OPTIC COMMUNICATION: Optical fibres, optical loss, Modes and configuration, Fibre materials, attenuation, signal distortion. Optical sources - LED, LASERS, Modulation and reliability considerations, Fibre to Fibre joint, splicing techniques. Optical receivers, Photo diodes, Photo detectors.

UNIT IX

INFORMATION THEORY AND CODING: Information measure, properties of various entropies, Noiseless coding, Kraft-Mcmillan inequality, Huffman's method of coding, coding Theorem. Noisy coding, classification of channels and their calculation, Decoding schemes. Correlation receiver, matched filter, Wiener filter, linear estimation. Testing of hypothesis, Parameter estimation.

UNIT X

TELEPHONY, COMMUNICATION SWITCHING AND ACOUSTICS: Telephony: Telephone hand sets, transmitters and receivers, telephone traffic variation, busy hours, lost calls, dialing methods, various signalling systems. Communication Switching: Simplex, duplex and quadruplex working

receivers, dialing methods, Digital Switching - circuit switching, packet switching, message switching, numbering plans Routing methods, signalling types, traffic measurements, EPABX modem. Acoustics: Microphone, different types - Loud speakers, different types - parameters - speech - hearing sound level meter - studio acoustics - sabine Formula - Reverbration time, stereo - effect.

CHEMICAL ENGINEERING

Degree Standard

PAPER-I

Code No: 025

UNIT I

CHEMICAL PROCESS CALCULATION AND CHEMICAL ENGINEERING THERMODYNAMICS:- Properties of gases liquids and solids - Gas laws - Thermodynamics functions - Chemical and Phase Equilibrium - Laws of Thermodynamics - Ideal and non-ideal gases and solutions - partial molal properties - Material and Energy balance involving recycle, by pass and purge, Thermochemistry.

UNIT II

MOMENTUM, HEAT AND MASS TRANSFER OPERRATIONS:- Newtonian and non-Newtonian fluids, compressible and non - compressible fluids, flow in closed ducts, packed beds and fluidised bed. Continuity and conservation equations. Heat transfer by conduction, convection and Radiation - Heat exchanger equipment. Laws of Diffusion, Theories of mass transfer, Interphase mass transfer. Analogy of the above three operations.

UNIT III

MECHANICAL OPERATIONS AND RENEWABLE ENERGY SOURCES:- Size reduction, particle size analysis, mixing and agitation, sedimentation, filtration, flotation: Potential for energy sources, energy conservation, Solar energy, Thermal, Photoelectric, Ocean, Geothermal, Wind energy, Bio-energy sources.

UNIT IV

ENGINEERING MATERIALS AND SAFETY IN CHEMICAL INDUSTRIES:- Materials of construction for chemical industries, metallic, non-metallic, ceramic and polymeric materials, corrosion. Industrial safety principles. Site selection and plant layout. Chemical hazards classification. Dangerous occupational health diseases. Engineering control of plants, safety in operations and processes.

UNIT V

CHEMICAL TECHNOLOGY:- Inorganic chemical Industries - an overview, Acids, Fertilisers, industrial gases, marine chemicals, cement, glass and ceramics, Refractories, Organic chemical Industries - an overview; natural products. Soap, Sugar, Paper, Rubber, Petroleum products, fermentation products, Intermediates and Dyes.

PAPER -II

UNIT I

Instrumentation and Process Control :- Principles, on - off, proportional, integral, Derivative and combined modes of control. Feed back control systems and its elements. Analysis of control systems, Measurement and control of Temperature, pressure, flow of fluids, PH and Humidity. Micro processor - based control.

UNIT II

Design & Optimisation and Environmental Engineering :- Process selection, flow diagrams, plant location and layout, optimisation techniques. Cost estimation, plant utilities, safety analysis of process plants. Environmental Engineering sources of impurities. Air and water quality standards, monitoring of pollutants, waste disposal, Noise pollution. Meteorology and air pollution.

UNIT III

Multi - Phase Mass Transfer Operations:- Absorption, distillation, liquid - liquid extraction, adsorption, membrane separation process, continuous contact operation and theory. Batch process. Chemical Engineering

UNIT IV

Chemical Reaction Engineering:- Chemical Kinetics, interpretation of rate data in variable volume and constant volume systems ideal reactors. Concept of ideality. Development of design expression for batch, tubular, and stirred tank reactors, combined reactors, comparison advantages and limitations in applications, thermal characteristics of reactors. Isothermal, adiabatic, non adiabatic condition - principles of reactor stability.

UNIT V

Numerical Methods and Computational Techniques:- Empirical laws and curvefitting - Equations with real Co-efficients and imaginary roots - equations with rational coefficients and irrational roots - symmetric functions of the roots - Transformation of equations. Numerical solutions of linear -

algebraic equations. Numerical solutions of non - linear - algebraic equations - solution of initial value ordinary differential equations. Boundary value of non - linear ODE - solution of partial differential equation.

PAPER-II
GENERAL STUDIES
Degree Standard

Unit-I General science :

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Physics Universe-General Scientific laws-Scientific instruments-Inventions and discoveries-National scientific laboratories-Science glossary-Mechanics and properties of matter-Physical quantities, standards and units-Force, motion and energy-Electricity and Magnetism, Electronics and Communication -Heat, light and sound-Atomic and nuclear physics-Solid State Physics – Spectroscopy- Geophysics - Astronomy and space science

Chemistry Elements and Compounds-Acids, bases and salts-Oxidation and reduction-Chemistry of ores and metals-Carbon, nitrogen and their compounds-Fertilizers, pesticides, insecticides-Biochemistry and biotechnology-Electrochemistry-Polymers and plastics

Botany-Main Concepts of life science-The cell-basic unit of life-Classification of living organism-Nutrition and dietetics-Respiration-Excretion of metabolic waste-Bio-communication.

Zoology-Blood and blood circulation-Endocrine system-Reproductive system-Genetics the science of heredity-Environment, ecology, health and hygiene, Bio- diversity and its conservation-Human diseases-Communicable diseases and non- communicable diseases- prevention and remedies-Alcoholism and drug abuse-Animals, plants and human life

Unit- II. Current Events

History--Latest diary of events – National--National symbols-Profile of States-Defence, national security and terrorism-World organizations-pacts and summits-Eminent persons & places in news-Sports & games-Books & authors -Awards & honours-Cultural panorama-Latest historical events--India and its neighbours-- Latest terminology- Appointments-who is who?

Political Science-1. India's foreign policy-2. Latest court verdicts – public opinion-3. Problems in conduct of public elections-4. Political parties and political system in India-5. Public awareness & General administration-6. Role of Voluntary organizations & Govt.,-7. Welfare oriented govt. schemes, their utility

Geography Geographical landmarks-Policy on environment and ecology—

Economics--Current socio-economic problems-New economic policy & govt. sector

Science-Latest inventions on science & technology-Latest discoveries in Health Science-Mass media & communication.

Unit-III. Geography

Earth and Universe-Solar system-Atmosphere hydrosphere, lithosphere-Monsoon, rainfall, weather and climate-Water resources --- rivers in India-Soil, minerals & natural resources-Natural vegetation-Forest & wildlife-Agricultural pattern, livestock & fisheries-Transport including Surface transport & communication-Social geography – population-density and distribution-Natural calamities – disaster management-Climate change - impact and consequences - mitigation measures-Pollution Control.

Unit-IV. History and culture of India

Pre-historic events--Indus valley civilization-Vedic, Aryan and Sangam age-Maurya dynasty-Buddhism and Jainism-Guptas, Delhi Sultans, Mughals and Marathas-Age of Vijayanagaram and the bahmanis-South Indian history-Culture and Heritage of Tamil people-Advent of European invasion-Expansion and consolidation of British rule-Effect of British rule on socio-economic factors-Social reforms and religious movements-India since independence-Characteristics of Indian culture-Unity in diversity –race, colour, language, custom-India-as secular state-Organizations for fine arts, dance, drama, music-Growth of rationalist, Dravidian movement in TN-Political parties and populist schemes- Prominent personalities in the various spheres – Arts, Science, literature and Philosophy

– Mother Teresa, Swami Vivekananda, Pandit Ravishankar , M.S.Subbulakshmi, Rukmani Arundel and J.Krishnamoorthy etc.

Unit-V Indian Polity

Constitution of India-. Preamble to the constitution- Salient features of constitution- Union, State and territory- Citizenship-rights amend duties- Fundamental rights- Fundamental duties- Human rights charter- Union legislature – Parliament- State executive- State Legislature – assembly- Status of Jammu & Kashmir- Local government – panchayat raj – Tamil Nadu- Judiciary in India – Rule of law/Due process of law- Indian federalism – center – state relations-. Emergency provisions- Civil services in India- Administrative challenges in a welfare state- Complexities of district administration- Elections - Election Commission Union and State. Official language and Schedule-VIII- Amendments to constitution- Schedules to constitution-. Administrative reforms & tribunals- Corruption in public life- Anti-corruption measures – Central Vigilance Commission, lok-adalats, Ombudsman, - Comptroller and Auditor General of India- Right to information - Central and State Commission- Empowerment of women- Voluntary organizations and public grievances Redressal- Consumer protection forms

Unit- VI. Indian economy

Nature of Indian economy-Need for economic planning-Five-year plan models-an assessment-Land reforms & agriculture-Application of science in agriculture Industrial growth-Capital formation and investment-Role of public sector & disinvestment-Development of infrastructure- National income- Public finance & fiscal policy- Price policy & public distribution- Banking, money & monetary policy- Role of Foreign Direct Investment (FDI)- WTO-globalization & privatization- Rural welfare oriented programmes- Social sector problems – population, education, health, employment, poverty-HRD – sustainable economic growth- Economic trends in Tamil Nadu -Energy Different sources and development- Finance Commission -Planning Commission- National Development Council

Unit-VI. Indian national movement

National renaissance-Early uprising against British rule-1857 Revolt- Indian National Congress- Emergence of national leaders-Gandhi, Nehru, Tagore, Nethaji -Growth of militant movements - Different modes of agitations-Era of different Acts & Pacts-World war & final phase struggle- Communalism led to partition-Role of Tamil Nadu in freedom struggle - Rajaji, VOC, Periyar, Bharathiar & Others-Birth of political parties /political system in India since independence-

Unit-VII. APTITUDE AND MENTAL ABILITY TESTS

Conversion of information to data-Collection, compilation and presentation of data - Tables, graphs, diagrams-Parametric representation of data-Analytical interpretation of data -Simplification- Percentage-Highest Common Factor (HCF)-Lowest Common Multiple (LCM)-Ratio and Proportion- Simple interest-Compound interest-Area-Volume-Time and Work-Behavioral ability -Basic terms, Communications in information technology-Application of Information and Communication Technology (ICT)- Decision making and problem solving-Logical Reasoning-Puzzles-Dice-Visual Reasoning-Alpha numeric Reasoning-Number Series-Logical Number/Alphabetical/Diagrammatic Sequences-
