



# TAMIL NADU PUBLIC SERVICE COMMISSION

**Advertisement No. 642**  
**Notification No. 36/2022**

**DATED: 13.12.2022**

Applications are invited from eligible candidates only through online mode upto 12.01.2023 for direct recruitment to the vacancies in the post of **Assistant Conservator of Forests included in Group-IA Services.**

## **WARNING**

- All the recruitments conducted by the Tamil Nadu Public Service Commission are purely merit based.
- The Tamil Nadu Public Service Commission hereby cautions the applicants against touts and agents who may cheat, by making false promises of securing jobs through unfair means.
- The Tamil Nadu Public Service Commission shall not be responsible or liable for any loss that may be caused to any applicant on account of indulging in any sort of dealings with such unscrupulous elements.
- Applicants are solely responsible for their claims in the online application. They cannot blame service providers like internet cafes/browsing centers/Common Service centers for the mistakes made while applying online for recruitment.
- Applicants are advised to check the filled in online application before finally submitting the same.
- Applicants shall mandatorily upload the certificates / documents (in support of all the claims made / details furnished in the online application) at the time of submission of online application itself. It shall be ensured by the applicants that the online application is submitted with all the required certificates.

**Applicants are directed to read all the information / instructions / guidelines given in this notification and the Commission's "Instructions to applicants" before applying for this recruitment. Clarification if any required may be obtained over phone and email well ahead of the last date for submission of online application. Candidates should follow the instructions given in the online application also.**

### **1. ONE TIME REGISTRATION:**

It is mandatory for applicants to register their basic particulars through One Time online Registration System on payment of Rs.150/- (Rupees One hundred and fifty only) towards registration fee and then they should apply only through online for this recruitment. The One Time Registration will be valid for five years from the date of registration. Thereafter, the registration should be renewed by paying the prescribed renewal fee. **One Time Registration will not be considered as an application / Examination fee for any post.** An applicant should submit online application separately for each and every examination / recruitment for which he / she intends to appear. The registration fee paid towards the One Time Registration is not an application /

**STATISTICS**  
**(DEGREE STANDARD)**

**Subject Code: 274**

**UNIT- I**

Uses, Scope and limitation of Statistics, Collection, Classification and Tabulation of data, Diagrammatic and Graphical representation, Measures of location, dispersion, Skewness and Kurtosis – Correlation and regression – Curve Fitting – Linear and Quadratic equation by the method of least squares.

**UNIT- II**

Probability - Addition, Multiplication and Baye's Theorems and their application. Tchebychev's inequality. Random variables – Univariate and Bivariate – Probability distributions – Marginal and conditional distributions – Expectations – Moments and cumulants generating functions.

**UNIT-III**

Probability distributions – Binomial, Poisson, Geometric and Hypergeometric. Continuous distributions – Uniform, exponential and normal. Sampling distributions and standard error, student's 't', Chi-square and F statistic – distributions and their applications.

**UNIT -IV**

Estimation – Point estimation – properties of estimates Neyman – Fisher Factorization theorem (without proof) Cramer – Rao inequality, Rao – Blackwell theorem – MLE and method of Moments estimation – Interval estimation – for population mean and variance based on small and large samples.

**UNIT -V**

Tests of Hypothesis – Null and Alternative – Types of errors – Power of test, Neyman – Pearson lemma, UMP and Likelihood ratio tests, Test procedures for large and small samples – Independence of attributes, Chi-square test – Goodness of fit.

**UNIT- VI**

Simple random sample – stratified, systematic, Cluster (Single stage) Estimation of mean and variance in SKS – Sample Survey – Organisation – CSO and NSSO – Sampling and Non-Sampling errors.

Analysis of Variance – Principles of design  $\bar{C}$  CRD, RBD and LSD – Factorial experiments  $2^2$ ,  $2^3$  and  $3^2$  (Without confounding) Missing plot techniques.

**UNIT- VII**

Concept of SQC – Control Charts – X, R, p and charts Acceptance sampling plan – single and double – OC curves Attributes and Variables plan.  
OR Models – Linear Programming problems – Simplex method Dual – Primal, Assignment problems, Network – CPM and PERT.

**UNIT-VIII**

Time series – Different components – Trend and Seasonal Variations – Determination and elimination.

**UNIT-IX**

Index Numbers – Construction and uses – Different kinds of simple and weighted index numbers – Reversal tests – construction and use of cost of living index numbers – Birth and death rates – Crude and standard death rates, Fertility rates – Life table construction and uses.

**UNIT-X**

Statistical Computing using Excel – Understanding on the usage of Statistical Packages including SPSS, MINITAB and SAS.

**GEOLOGY**  
**(DEGREE STANDARD)**

**Subject Code: 239**

**UNIT- I: GENERAL GEOLOGY**

Origin, Interior and Age of the Earth - Weathering - Types and products - Geological work of Wind, River, Sea and Groundwater - Volcanoes - Earthquakes - causes and effects - Seismic zonation - Richter Scale - Principles of Plate Tectonics – fundamental and geomorphology.

**UNIT- II: STRATIGRAPHY**

Principles of Stratigraphy - Correlation - Geological Time Scale - General characteristics, descriptive and economic importance of Archean, Cuddapah, Vindhyan and Gondwana systems of Peninsular India -Cretaceous system of Tamil Nadu.

**UNIT- III STRUCTURAL GEOLOGY**

Folds - Faults - Joints - Unconformities - Recognition of overturned beds - Stress and strain relationship - Attitude of beds - Measurement of dip, apparent dip, strike using Cino and Brunton Compass.

**UNIT- IV: PALAEOONTOLOGY**

Fossils – Definitions, Conditions, mode of preservation, uses of Fossils – General morphology and classification of Graptolites, Mollusca, Coelenterata, Brachiopod, Trilobita, Echinoids and Foraminifera.

**UNIT –V: CRYSTALLOGRAPHY**

Definition of crystals – Inter facial angles – Goniometer -Symmetry Elements - Study of Normal Classes of Isometric, Tetragonal, Hexagonal, Orthorhombic, Monoclinic and Triclinic systems - Twin crystals.

**UNIT- VI: MINERALOGY**

Physical properties of minerals - Petrological Microscope and its parts, accessory plates and uses – optical properties - Isotropic and Anisotropic Minerals - Descriptive study of quartz and its varieties - Feldspar Group - Pyroxene Group - Amphibole Group - Mica Group - Garnet Group - Descriptive study of Calcite, Dolomite, Tourmaline, Topaz, Staurolite, Chlorite and Zircon.

**UNIT –VII: IGNEOUS PETROLOGY**

Definition of magma - Composition and constitution of magma - Forms and structures of Igneous Rocks, Textures and Micro structures - classification of Igneous rocks - Bowen's Reaction principle - Descriptive Study of Granite - Syenite - Diorite - Gabbro – Dolerite - Ultramafics (Dunite, Peridotite, Pyroxenite and Anorthosite) - Differentiation - Assimilation.

**UNIT –VIII: SEDIMENTARY AND METAMORPHIC PETROLOGY**

Classification - Texture and structures of sedimentary rocks - Descriptive study of Residual, Clastic, Chemical and organic deposits - Metamorphism - Agents and kinds of metamorphism - classification of metamorphic rocks - Textures and structure - Different facies - Marble – Schist and Gneiss - Amphibolite - Granulite (Charnockite).

**UNIT- IX: ECONOMIC GEOLOGY I**

Definition of Ore - Tenor - Gangue - Lindgren and Bateman's classification of ore deposits - Ore forming processes - Magmatic concentration – Hydrothermal Process Oxidation and Supergene Enrichment – Evaporation - Sedimentation – Placer deposits. Important ores, their composition, physical properties, mode of occurrence, distribution in India and uses of Gold, Iron, Aluminium, Manganese, Copper, Magnesium and Lead and Zinc - Lignite, Coal and Petroleum - their occurrence in India - Building Stones, their characters, distribution and mode of occurrence in India - Mineral Wealth of Tamil Nadu.

**UNIT- X: APPLIED GEOLOGY**

Principles of Geological mapping - Field Techniques - Drilling methods - Borehole problems from borehole data – Geological investigation and conditions for dams, tunnels and roads - Landslides – Mining methods, role of geology - problems in mines including groundwater – Application of Remote sensing in Geology.

**AGRICULTURE**  
**(DEGREE STANDARD)**

**Subject Code: 284**

**UNIT- I: IMPORTANCE OF AGRICULTURE**

Importance of Agriculture in Indian Economy and its sectoral relationship - Agricultural Development through five year plans in India and Tamil Nadu - Growth pattern of crops in India and Tamil Nadu in terms of area, production and productivity - Government Agricultural Policies - Agricultural development through NITI AYOOG - import and export - role of NSC, FCI and PDS.

**UNIT - II: FUNDAMENTALS OF CROP PRODUCTION**

Factors of Production - Agricultural seasons of India and Tamil Nadu - Cropping patterns in India and Tamil Nadu - package of practices of different crops - Agro-Climatic zones of India and Tamil Nadu and their features - Weather and Climate - Weather forecasting - Climate change and its impact - Minimal tillage practices - Stress mitigating technologies including microorganisms - Nanoparticles and their applications.

**UNIT - III: NATURAL RESOURCE MANAGEMENT**

Soil - Soil structure - Factors influencing soil structure - Physical and Chemical properties - Effect of nutrient availability and plant growth - Problem soils and their management - Soil survey - its objectives and scope - Soil fertility and productivity - Dry farming - Rainfed agriculture - Conservation of soil and water - Watershed and waste land development. Land use pattern and planning - Size and distribution of holdings - types and systems of farming - Water resources development and management - Command area development - Ground water Development and Conjunctive use - Water use efficiency - Quality of irrigation water - Its effect in soil and crops - Management of poor quality water for crop growth.

**UNIT - IV: CROP MANAGEMENT & ALLIED AGRICULTURAL ACTIVITIES**

Cropping systems and integrated farming - Recycling of agricultural waste - Organic manures, green manures, bio fertilizers - Balanced usage - integrated nutrient management - Physiological disorders in crop plants and their management- Irrigation management of different crops Mushroom cultivation, bee keeping, silkworm rearing etc., Energy in Agricultural production - Sources - Solar, wind, animal, biomass and biogas - Mechanization in agriculture - Tractors & tillers - Agricultural implements and Machineries and their usage - livestock and poultry rearing.

**UNIT -V: CROP IMPROVEMENT**

Principles of breeding - Breeding methods in self , cross and vegetatively propagated crops - Modern tools in crop improvement - Heterosis breeding and Hybrid seed production technologies - Latest varieties of major crops in Tamil Nadu - Breeding for Climate resilience varieties - Variety release procedures - Application of bio technology in Agriculture - Tissue culture & its significance - Transgenic Plants. Plant Genetic Resources: Collection conservation and exchange-Crop varietal protection-PPV& FR authority and its role.

**UNIT- VI: SEED SCIENCE AND TECHNOLOGY**

Seeds - Importance of quality seeds in Agriculture - Nucleus, Breeder, foundation, certified and labelled seeds - Seed certification techniques and processing in Tamil Nadu - Seed testing - Seed testing laboratories-ISTA standards for seed testing - seed village concept Seed Act - Seed coating and priming technologies - Seed enhancement technologies.

**UNIT – VII: CROP PROTECTION PRINCIPLES AND PRACTICES**

Importance of pest, disease, nematodes and weed management in agriculture - categories of pests, diseases, nematodes and weeds - pest and disease surveillance and forecasting weather on pest and disease incidence - Symptoms of damages and control measures of pest, disease and nematodes of major crops in Tamil Nadu - Integrated pest, disease and nematode management in crop production - Pesticides and their use in IPM - mode of action - Pattern - plant protection equipments and their use - Plant quarantine. Storage pests, disease and nematodes and their management. Importance of biological control in pest, disease and nematode management. Weeds - Major weeds and their control.

**UNIT – VIII: FARM BUSINESS AND FINANCE MANAGEMENT**

Farm business management - Principles of farm business management - Types and systems of farms-Classical Production Functions - Cost concepts - Management of resources - Farm Planning and budgeting - Investment analysis - Risk and uncertainties in Agriculture - Agricultural credit system in India - Multi credit delivery system - Role of nationalized banks, NABARD and Regional Rural Banks - Lead Bank Scheme - Service area approach - Scale of finance-Credit Worthiness-3 Rs,5Cs and 7Ps of credit- Crop Insurance- Kisan Credit Cards (KCC) - Agricultural Insurance Company.

**UNIT –IX: AGRICULTURAL MARKETING AND MARKET INTELLIGENCE**

Marketing - Agricultural marketing - Market structure - Marketing Efficiency - Price Spread- Market Integration-Market Risk-Speculation and hedging - Market Institutions- Warehouses and rural godowns - Agmark-Cooperatives - Commodity Boards - Agri business management - Principles of Management-Entrepreneurship Development - Forms of Business organizations - Agricultural Price Policy - CACP-MSP - FRP- Procurement Price-Policies for agricultural development - Economic liberalization - WTO and its impact on agricultural export - Importance of Agriculture in Indian economy - Land size and distribution of holdings and land use pattern in Tamil Nadu - Agriculture under Five year Plans (FYs) - Food Security - Public Distribution Systems (PDS) - Buffer Stock.

**UNIT - X: AGRICULTURAL EXTENSION: PRINCIPLES AND METHODS**

Extension methods for transfer of technology - AV aids-Communication models - Use of ICT in transfer of technology-Diffusion and adoption- Pre and post independence rural development initiatives: key features, strength and weakness of individual programmes - Programme planning and evaluation methods- Rural sociology - key features of Indian rural system-value system-social change- rural migration. Role of women in Agriculture



**HORTICULTURE**  
**(DEGREE STANDARD)**

**Subject Code: 278**

**UNIT- I: FUNDAMENTALS OF HORTICULTURE**

Scope and importance – State, National and Global scenario of horticultural crops – Area and production – Import and export – Nutritive value of horticultural crops – Horticultural zones of Tamil Nadu and India – National and regional agencies involved in promotion of horticultural Industry in India (NHB, APEDA and Commodity Boards) – Classification of horticultural crops – Factors limiting horticultural crop production – Role of season – Soil and climate requirements - Physical and chemical properties of soil - Climatic factors – Light, temperature, photoperiod, relative humidity, rainfall, altitude, microclimate - Kitchen gardening - Nutrition gardening – Truck gardening – Market gardening - Vegetable forcing - Protected and precision horticulture – Hydroponics, Aeroponics – Nutrient Film Technique - Horticulture therapy.

**UNIT - II: GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS**

Important phases of growth and development - Bearing habits – Classification of horticultural crops based on life cycle – Annual, biennial perennial (woody and herbaceous perennials) – Fruitfulness and unfruitfulness - External and internal factors associated with unfruitfulness – Physiology of flowering, fruit set, ripening and senescence – Fruitdrop - Causes and control measures - Plant growth regulators – Functions and role in horticultural crops - Bud dormancy – Dormancy breaking – Parthenocarpy – Parthenogenesis – Polyembryony – Stenospermocarpy – Vivipary - Apomixis.

**UNIT - III: PROPAGATION OF HORTICULTURAL CROPS**

Propagation – Definition – Establishment of nursery – Site selection - Tools and implements propagation structures - Mist chamber, phytotron - Humidifiers – Greenhouse – Glasshouse – Polyhouse - Shade net, glass house, poly tunnels, cold frames and hotbeds, pit nursery - Media and containers – Soil sterilization - Sexual propagation – Merits and demerits – Crops propagated through seeds - Seed viability, longevity, dormancy, germination – Pre-sowing treatment – stratification, scarification, seed priming, seedling vigour – Raised seed bed and pro-tray nursery – Asexual propagation – Merits and demerits – Methods of vegetative propagation – Identification of plus trees – Mother block, scion bank – Clonal nursery – Cutting – Layering – Grafting, budding types – Anatomical and physiological basis of grafting – Stock scion relationship, graft compatibility - Budwood selection and certification – Propagation through specialized plant parts (bulbs, tubers, offsets, runners, suckers, slip, crown, rhizomes, corms) – Quality management and nursery certification – Micro propagation – Application – infrastructure requirements – Types of media – Stages of micro propagation – Micro grafting – *in vitro* propagation of important horticultural crops.

#### **UNIT - IV: MANAGEMENT TECHNIQUES FOR HORTICULTURAL CROPS**

Planning – Layout and management of orchards – Fencing – Wind breaks and shelter beds – Spacing – Planting system – Physical and chemical properties – Soil reaction – acid, saline and alkaline soils – Soil fertility - Essential elements – Functions - Organic manures and inorganic fertilizers, bio-fertilizers, vermicomposting - Applications and management – Nutrient deficiencies and corrective measures - Physiological disorders and remedies - Irrigation – Critical stages of water requirement – Effect of water stress on crop yield – Anti-transpirants – management of irrigation water quality - Conventional and micro irrigation – Fertigation - Mulching – Sod culture – Weed management – Application growth regulators – Training and pruning principles and methods - Rejuvenation of senile and old orchards – Cropping systems - Cover cropping - Multitier cropping – Intercropping – Special horticultural techniques (pinching, thinning, disbudding, blanching, smudging, notching, ringing) - Principles of organic horticulture – GAP and GMP.

#### **UNIT - V: PRODUCTION TECHNOLOGY OF FRUIT CROPS**

Scope and importance of fruit crops - Composition and uses - Origin and distribution – Species – Season - Climate and soil requirement – Varieties and hybrids – Propagation techniques - Planting systems and planting density - Including High density planting (HDP) and ultra high-density planting (UHDP) – spacing – Water and nutrient management – Fertigation - Weed management - Canopy management - Training and pruning – Intercultural practices - Off season production - Special horticultural techniques – Use of plant growth regulators – Maturity indices - Harvest and yield – Nutrient deficiencies and physiological disorders and its corrective measures and management of important pest and diseases of important fruit crops :- Mango, Banana, Acidlime, Sweet orange, Mandarin, Grapes, Papaya, Guava, Sapota, Pineapple, Jackfruit, Pomegranate, Aonla, Annona, Ber, Apple, Pear, Plum, Peach, Strawberry, Litchi, Avocado, Walnut and Almond and minor tropical, arid and temperate fruit crops.

#### **UNIT- VI: PRODUCTION TECHNOLOGY OF VEGETABLE CROPS**

Scope and importance of vegetable crops - Composition and uses – Origin and distribution – Area and production - Soil and climatic requirements - Varieties and hybrids – Propagation methods - Seed rate – Sowing and nursery practises – Containerized seedling production - Season – Planting methods – Water, nutrient and weed management – Fertigation – Training for vegetables – Intercultural practices - Maturity indices – Harvest and yield – Nutrient deficiencies and physiological disorder and its corrective measures of important vegetable crops: Tomato, Brinjal, Chilli and Capsicum (Sweet Pepper), Bhendi, Leguminous vegetables (Beans, Peas, Cluster beans, Cowpea, Dolichos bean); Bulbous vegetables (Onion, Garlic); Tuber crops - (Potato, Tapioca, Sweet potato, Elephant footyam, Colacassia); Cucurbitaceous vegetables (Cucumber, Bittergourd, Snakegourd, Ridgegourd, Ashgourd, Muskmelon, Watermelon, Pumpkin) - Cruciferous vegetables (Cabbage, Cauliflower and Knolkhol); Root vegetables (Carrot, Radish, Beetroot, Turnip) - Leafy vegetables (Spinach, Lettuce, Palak, Amaranthus) – Perennial vegetables (Drumstick, Coccinea) – Protected cultivation of vegetable crops - Precision farming of important vegetable crops and seed production.

### **UNIT – VII: FLORICULTURE & LANDSCAPE GARDENING**

Scope and importance of flower crops production - Uses - Origin and distribution – Area and production - Climate and soil requirement - Species and varieties - Propagation, season - Spacing and planting methods - Irrigation, nutrient management – Fertigation – Weed management - Training and pruning – Intercultural operations – Special horticultural techniques – Growth regulators – Off season production - Maturity indices – Harvest and yield and management of important pest and diseases for important loose flower crops: Jasmine, Rose, Tuberosa, Chrysanthemum, Marigold, Nerium and Crossandra - Cut flowers - Rose, Carnation, Anthurium, Orchid and Gerbera – Cut foliage and fillers. Principles of Landscape designing – Styles of gardening - Types of gardening viz., Hindu, English, Mughal, Japanese, Persian, Italian, French gardening – Garden components – Trees foliage flowering and avenue trees – Burlapping – Shrubs – Flowering annuals creepers and Climbers - Cacti and succulents - Lawn – Astro turf - Types of grasses – Layout, planting and maintenance of lawn – Hedge and edge plants - Indoor plants and interior scaping – Garden adornments - Principles and styles of flower arrangements – Bonsai styles and culture – Industrial, Institutional, Public and Private landscaping - Special types of gardening – Bog garden, dish, terrarium, bottle, roof, vertical gardening and green wall.

### **UNIT – VIII: PRODUCTION TECHNOLOGY OF SPICES AND PLANTATION CROPS**

Scope and Importance of spices and plantation crops - Composition and uses - Origin and distribution – Area and production – Climate and soil requirements - Species and varieties - Season, seed rate / propagation methods – Spacing - Planting system – High density planting – Irrigation and nutrient management – Fertigation and weed management – Training and pruning – Cropping systems – Multitier cropping – Cover cropping – Inter cropping - Growth regulators – Mulching - Shade and canopy regulation – Maturity indices, harvest, yield and management of important pest and diseases and processing methods of important plantation and spice crops: Major, seed, tree, herbal spices and minor spices - Black Pepper, Cardamom, Turmeric, Ginger, Curry leaf, Clove, Nutmeg, Cinnamon, Coriander, Fenugreek, Cumin, Tamarind, all spice and vanilla – Plantation crops - Tea, Coffee, Rubber, Cocoa, Coconut, Oil palm, Cashew, Palmyrah, Arecanut.

### **UNIT – IX: PRODUCTION TECHNOLOGY OF MEDICINAL AND AROMATIC CROPS**

Scope and importance of medicinal and aromatic crops - Composition and uses - Origin and distribution – Area and production - *Ex situ* and *in situ* conservation – Classification of medicinal and aromatic crops – Constraints in medicinal plant cultivation - Climate and soil – Varieties – Propagation - Nursery practices - Planting methods - Cropping systems – Manures & fertilizers – Irrigation – Intercultural operations – Harvest indices – Harvest & yield and management of important pest and diseases - Production systems - Contract farming – GAP – GCP – GMP - Organic production and certification – Classification and distillation methods of essential oils – Secondary metabolite production - Value addition - Organisational support for promotion of medicinal and aromatic crops –

Medicinal crops: Senna, Periwinkle, Glory lily, Aswagandha, Medicinal coleus and Solanum, Sweet flag, Aloe, Isabgol, *Phyllanthus*, *Stevia*, Opium poppy.

Aromatic crops: Lemon grass, Citronella, Vetiver, Ocimum, Davana, Mint, Geranium, Patchouli and Eucalyptus.

### **UNIT - X: POST- HARVEST TECHNOLOGY OF HORTICULTURAL CROPS**

Importance of post-harvest handling in horticultural crops – Maturity indices – Post- harvest handling methods – Washing – Grading - Waxing – Grades and standards – Methods of packing - Types of containers and their advantages and disadvantages – Storage - Principles and methods of refrigerated and gas storage - Storage methods - Pre-cooling - Controlled atmospheric storage, Modified atmospheric storage – Low pressure storage and cold chain concept - Importance and scope of processing industry in India, general principles of fruit and vegetable preservation like canning, dehydration, freezing, fermentation - Use of chemicals(preservatives) and irradiation – GMP – Food safety and quality control.

**AGRICULTURAL ENGINEERING**  
**(Degree standard)**

**Subject Code: 280**

**UNIT-I: SURVEYING AND HYDROLOGY**

Surveying – Instruments - Methods of surveying – Computation of area – Triangulation, intersection, traversing, cross staff survey – Plane table survey – Earth work computation - Simpson's trapezoidal rule - **Levelling - Definition - Types of benchmarks – Different types of levels** – Reduction of leveling data by rise and fall method and height of collimation method - Contouring – Profile surveying - Cross section survey - **Use of Minor instruments** - Hydrology – Measurement of rainfall, evaporation and infiltration – Estimation of runoff – Factors affecting runoff – Computation of volume of runoff and peak flow – Unit hydrograph - Occurrence of ground water, hydraulics of wells, types of wells and their construction - **Well drilling – Techniques for different formations - Well logging - Types of well screen - Design of well screens - Well development - Yield testing.**

**UNIT-II: SOIL EROSION AND CONSERVATION**

Soil erosion – Types – Factors affecting erosion by water and wind - Stages of water erosion - Biological control measures - Biological control measures and their suitability - Contour farming, strip cropping, mixed cropping, intercropping and mulching - Mechanical control measures and their suitability – Design and construction of contour bunds, graded bunds, terraces, contour stone walls, contour trenches, staggered trenches and diversion drain - Gully control structures and check dams - Wind erosion – Types and control - **Dry farming techniques for improving crop production** - Estimation of soil erosion - Universal Soil Loss Equation.

**UNIT-III: WATERSHED DEVELOPMENT AND MANAGEMENT**

Watershed – Concept, types and delineation - Land capability classification - **Participatory rural appraisal technique** – Watershed development plan – Estimation of cost and benefits - Gully and ravine reclamation – **In-situ & Ex-situ** water harvesting, micro catchments – Ground water recharge - Farm pond and percolation pond – Selection of suitable soil and water conservation practices – Afforestation – Holistic planning - Watershed based rural development – Use of aerial photography and remote sensing in watershed management - Applications of GIS in planning and development of watersheds including forest cover and water resources.

**UNIT-IV: IRRIGATION AND DRAINAGE**

Irrigation - Sources – Soil- water- Plant relationship - Water requirement of crops – Measurement of irrigation water - Weirs and flumes - Methods of irrigation - Surface, sprinkler and drip irrigation - **Drip irrigation – Components - Wetting pattern - Filters and Fertigation tanks - Design of laterals - Submain - Main lines - Pump capacity - Operation and maintenance - Sprinkler irrigation - Components - Sprinkler performance - Hydraulic design of sprinkler systems - Duty and delta relationship – Irrigation scheduling** - Irrigation efficiencies and their estimation - Pumps - Types, selection and installation - Drainage - Causes of water logging and salt

problem - Methods of drainage - Design of surface, sub-surface and vertical drainage systems - Improvement and utilization of poor quality water - Reclamation of saline and alkali soils.

### **UNIT-V: FARM AND IRRIGATION STRUCTURES**

Design and construction of farm structures - Site selection - Materials of construction - Quality- types of masonry - Foundation, basement and superstructure - Types of roofs - building plan and estimation, requirements of farm house, threshing floor, drying floor, poultry house, dairy farm, rat proof godown and farm roads - Design features earthen dams and gravity dams - Water conveyance structures - Earthen channels and lined channels - Advantages of lining - materials of lining - Design of channel cross section - Crossing control structures - Drop spillway, chute spillway, pipe inlet spill way - Road crossing structures - Culvert, inverted siphon aqueduct - Their uses - Underground pipe line system - Components and their functions - Structures for plant environment - Green houses, polyhouses and shadenets - Construction and utilization - **Soil less culture.**

### **UNIT-VI: FARM POWER**

Agricultural mechanization - Scope and sources of farm power - Animate and electromechanical - Thermodynamics - Construction and working of internal combustion engines - Fuel, ignition, lubrication, cooling, air intake, exhaust, governing and electrical systems of IC engines - Different types of tractors and power tillers - Power transmission, ground drive, power takeoff, steering, brake, implement control and hydraulic systems - Bulldozer - Features, traction, suspension, steering, operations using bulldozer - Weight transfer, theory of traction - Tractive efficiency - Mechanics and stability - Care and maintenance of tractors.

### **UNIT- VII: FARM MACHINERY**

Farm machinery - Primary tillage implements - Mould board plough, disc plough and chisel plough - Secondary tillage implements - Cultivators, harrows and rotary tillers - Land shaping machinery - Leveller, ridger and bund former - Sowing and transplanting - Seed drills, planters and rice transplanters - Interculture implements - Plant protection equipment - Sprayers and dusters - Harvesting, threshing and combining equipment - Machinery for earth moving and land development - Machinery for horticulture, agro-forestry and forages - Haulage of agricultural and forest produces - **Management of farm machinery** - Cost estimation for farm operations.

### **UNIT-VIII: UNIT OPERATIONS IN FOOD AND AGRICULTURAL PROCESSING**

Heat transfer principles - Conduction, convection and radiation - Types of

heat exchangers - Unit operations – Evaporators - Types - Mechanical separation – Filtration – Sedimentation – Settling – Centrifugal separation – **Cyclone separation** - Size reduction – Mixing – Blending – emulsification - Food processing operations - Pasteurization – Sterilization – Canning - **Retort processing** - **Extrusion processing of foods** - Methods of drying of foods – Preservation of food by irradiation - Microwave and dielectric heating - Fats and oil processing – Extraction methods and equipments - Food packaging – Materials and characteristics – **Suitability** - Processing of milk and milk products, packaging of milk - Principles of refrigeration and applications in food industries – Cold storage of fruits and vegetables - **Design aspects.**

### **UNIT-IX: PROCESS ENGINEERING OF AGRICULTURAL AND HORTICULTURAL CROPS**

Engineering properties of food materials – Moisture content – **Methods of determination** Psychrometry - Drying – Thin layer and deep bed drying – Types of heat sources and **types of dryers** - Cleaning and grading – Principles – Separators – Efficiency – Performance index - Shelling and decortication – Seed processing and layout of seed processing units - Rice processing – Parboiling and dehusking of paddy – Machines used - Milling of wheat, corn and pulses - Material handling equipments - Conveyors and elevators - Storage – Conditions for safe storage – Bag and bulk storage – **Silo storage** - **Design aspects** - Modified atmosphere storage – Storage structures - Equipments used for processing of horticultural crops – Preservation of fresh fruits and vegetables – Drying and dehydration – Processing of coffee, tea, rubber, cashew nut, coconut, oil palm, aromatic plants, flowers and spices.

### **UNIT-X: RENEWABLE AND BIOENERGY**

Solar energy – Solar collectors – Air heaters – Water heaters – Solar photovoltaic systems and applications - Wind energy - Suitable sites – Types of wind mills – Wind mill components – Applications – Performance of wind mills - Biomass resources – Agro residues – Characteristics - Conversion technologies – Biochemical conversion – Biogas plant – Types and selection, construction, operation and maintenance - Slurry handling - Thermochemical conversion – Stoves – Types - Improved stoves – Pyrolysis – Charcoal production – Gasification – Briquetting – Cogeneration - Energy plantation and environmental impact – Global warming – Clean development mechanism (CDM) and role of afforestation - Biofuels – Biodiesel feedstock, production and by-product utilization – Ethanol – Production and utilization – Emission - Standards and control.

**CIVIL ENGINEERING**  
**(DEGREE STANDARD)**

**Subject Code: 261**

**UNIT I : BUILDING MATERIALS AND CONSTRUCTION PRACTICES**

Properties of engineering materials-brick, stones, aggregates, cement (types and grades), concrete (mix design), Concrete admixtures, Self compacting Concrete, steel and new materials. - Construction of stone masonry, brick masonry and R.C.C. and block masonry- construction equipments - Building bye - laws and Development regulations practiced in Tamil Nadu - Provisions for fire safety, lighting and ventilation- Acoustics.

**UNIT II : ENGINEERING SURVEY**

Survey - computation of areas - Chain Survey - Compass surveying - Plane table survey - levelling - fly levelling - L.S. and C.S. - Contour volumes - Theodolite survey - Traversing - Heights and Distances - Geodetic Observations- Tacheometry and Triangulation - Use of EDM, GPS and Remote sensing techniques.

**UNIT III : STRENGTH OF MATERIALS**

Stresses and strains -Thermal stresses- elastic constants - Beams and bending - Bending moment and shear force in beams - Theory of simple bending - deflection of beams - torsion - Combined stresses – stresses on inclined planes - Principal stresses and principal planes - Theories of Failure – Analysis of plane trusses.

**UNIT IV : STRUCTURAL ANALYSIS**

Indeterminate beams - Stiffness and flexibility methods of structural analysis - Slope deflection - Moment Distribution method – Arches and suspension cables - Theory of columns - moving loads and influence lines – Matrix method- Stability of retaining walls – plastic theory.

**UNIT V : GEOTECHNICAL ENGINEERING**

Formation of soils - types of soils - classification of soils for engineering practice - Field identification of soils - Physical properties of soils - Three phase diagram - permeability characteristics of soils - stress distribution in soils - Theory of consolidation, shear strength parameters of soils - Compaction of soils. Soil exploration - Soil sampling techniques - Borelog profile - shallow foundations - Terzhagi's bearing capacity theory - Pile foundation - Group action of piles - settlement of foundations.

**UNIT VI : ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL**

Sources of water - Ground water Hydraulics - Characteristics of water - Water analysis - water treatment - water borne diseases. Sewerage system - Design of sewerage systems - sewer appurtenances - Pumping of sewage - sewage treatment and disposal - Industrial waste treatment - solid waste management - Air, water and Noise pollution control- ewaste management.

**UNIT VII : DESIGN OF REINFORCED CONCRETE, PRESTRESSED CONCRETE AND STEEL STRUCTURES**

Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs - Design of singly and doubly reinforced sections and flanged sections -design of columns and footings – pre-stressing - systems and methods- post tensioning slabs - Design of pre-stressed members for flexure.



Design of tension and compression members - Design of Bolted and welded connections design of members of Truss - designs of columns and bases - design of beams, plate girders and gantry girder

### **UNIT VIII : HYDRAULICS AND WATER RESOURCES ENGINEERING**

Hydrostatics-applications of Bernoulli equation — flow measurement in channels, Applications of Momentum equation, Kinematics of flow.

Water resources in Tamil Nadu - Water resource planning - Master plan for water management flood control –Runoff estimation — hydrograph — flood routing - Soil plant water relationship - Water requirement of crops - Irrigation methods –Design of alluvial canal and design of headworks. Waterlogging and land reclamation - Cross drainage works.

### **UNIT IX : URBAN AND TRANSPORTATION ENGINEERING**

Urbanisation trend and impact - Slum clearance and slum improvement programmes - Different modes of transport and their characteristics. Geometric design of highways. — Design and Construction of bituminous and concrete roads - Maintenance of roads.

Railways-Components of permanent way - Signalling, Interlocking and train control.

Airportplanning-Components of Airport - Site selection — Runways — Planning of terminal buildings. Harbours & Ports- Layout of a harbour - Docks - Breakwaters.

### **UNIT X : PROJECT MANAGEMENT AND ESTIMATING**

Construction management - Construction planning - Scheduling and monitoring - Cost control, Quality control and inspection - Network analysis - CPM and PERT methods of project management - Resources planning and resource management. Types of estimates - Preparation of technical specifications and tender documents - Building valuation - law relating to contracts and arbitration.

**CHEMICAL ENGINEERING****(DEGREE STANDARD)****Subject Code: 260****UNIT-I: CHEMICAL PROCESS CALCULATIONS AND CHEMICAL ENGINEERING****THERMODYNAMICS**

Properties of gases liquids and solids, Humidity and saturation, Gas laws, Material and Energy balances- involving recycle, by pass and purge systems, Material and Energy balance with reactions.

Thermodynamics functions - Chemical and Phase Equilibrium - Laws of Thermodynamics -Ideal and non-ideal gases and solutions – fugacity, partial molal properties.

**UNIT- II: MECHANICAL OPERATIONS AND ENGINEERING MATERIALS**

Size Reduction, law, particle size Analysis, Mixing and agitation, Filtration, Sedimentation and Settling, Materials of construction for chemical Industries, Metallic, Non-metallic and Polymeric materials, corrosion. Grinding, Law. Smart materials for Chemical Engineering applications.

**UNIT- III: CHEMICAL TECHNOLOGY AND RENEWABLE ENERGY SOURCES**

Acids, Fertilizers, marine Chemicals, Cement, Glass, Ceramic and Refractories. Petroleum Refining Products, Fermentation Products, Oils, Soaps and Detergents, Pulp and paper, Dyes, sugar, leather and rubber.

Potential for energy resources, energy conversion, solar, thermal, photoelectric, ocean, geothermal, wind energy, bio-energy sources, battery and fuel Cells.

**UNIT- IV: TRANSFER OPERATIONS**

Momentum: Newtonian and Non-Newtonian fluids, Compressible and incompressible fluids flow through packed bed, Fluidized bed and closed ducts, Fluid Machinery. Heat transfer: conduction, convection and radiation, Heat transfer with phase change, heat exchangers, Evaporation.

Mass transfer: Diffusion, Theories of mass transfer, Inter phase mass transfer, Analogy. Distillation, Extraction, Absorption, Adsorption, Drying.

**UNIT V: CHEMICAL REACTION ENGINEERING**

Chemical Kinetics, Rate equations, Interpretation of rate data, Design of reactors, order of reaction, Catalysis, Thermal characteristics of reactors. Isothermal and adiabatic fixed bed reactors, non-isothermal and non-adiabatic fixed bed reactors. Two-phase fluidized bed model, slurry reactors, trickle bed reactor. Experimental determination and evaluation of reaction kinetics for heterogeneous systems.

**UNIT VI: INSTRUMENTATION AND PROCESS CONTROL**

Principles of measurements and classification of process instruments, measurement of temperature, pressure, fluid flow, liquid weight and weight flow rate, viscosity, pH, concentration, electrical and thermal conductivity, humidity of gases.

Laplace transformation, application to solve ODEs. Open-loop systems, first order systems, first order systems in series, linearization and its application in process control, second order systems and their dynamics; transportation lag. Closed loop control systems, feed-back control systems, BODE diagram, stability criterion, tuning of controller settings, cascade control, feed forward control, Smith predictor controller, control of distillation towers and heat exchangers.

**UNIT VII: NUMERICAL AND COMPUTATIONAL METHODS**

Curve fitting, Equations with real and rational Coefficients, Imaginary roots and irrational roots, Transformation of equations. Numerical solutions of linear and non linear algebraic equations- solution of initial value and boundary value ordinary and non-linear differential equations, solution of partial differential equations. Partial Differential equation – finite element, finite difference method.

Matrix, determinants and properties – Elementary Row transformations algebraic equations; ordinary differential equations and non homogeneous first order ordinary differential equations rank of Matrix – Eigen value problems, Orthogonal and orthonormal vectors; Gram-Schmidt orthogonalization; Theorem for Eigenvalues and Eigenfunctions.

**UNIT VIII: SEPARATION OPERATIONS**

Crystallization, Membrane separation processes. frame, tubular, spiral wound and hollow fibre membrane reactors, dialysis, reverse osmosis, nano/ultra filtration, microfiltration. Ion Exchange chromatography and electrodialysis, Separations involving pervaporation and permeation techniques for solids, liquids and gases, supercritical fluid extraction.

**UNIT IX: ENVIRONMENTAL ENGINEERING AND SAFETY IN CHEMICAL INDUSTRIES**

Air, Water and soil pollution, causes, effects and remedies, Nuclear waste disposal, Noise control, Wastewater treatment by various methods: Chemical, biochemical and advanced oxidation process.

Industrial hygiene, occupational safety. Industrial safety principles, site selection and plant layout, chemical hazards classification, Safety in operations and processes, hazardous identification techniques.

**UNIT X: DESIGN AND OPTIMIZATION**

Problem formulation, degree of freedom analysis, objective functions, Simplex method, Barrier method, sensitivity analysis, Convex and concave functions, unconstrained NLP, Newton's method, Quasi-Newton's method, Direct substitution, Quadratic programming, Cost estimation, Plant utilities, Heat exchanger networks, Pinch technology.

**COMPUTER / COMPUTER SCIENCE ENGINEERING**  
**(DEGREE STANDARD)**

**Subject Code: 303**

**UNIT - I: C PROGRAMMING AND OOP**

Functions and Pointers in C: Storage classes – Recursion – Preprocessor directives – Arrays – Strings – Arrays, pointers and strings. Pointers to functions – Dynamics Memory Allocation – Structures – Unions – Enumeration Types – Bit fields – Files – Object Oriented Programming: Classes and methods – Constructors and Destructors – Class and Object – Scope – Overloading – Arrays – Type Casting – Pointer. Java API Packages – Inheritance – Sub Classes – Implications of Inheritance – Exception Handling – Assertions – Garbage Collection – String Class – Inheritance – Multiple Inheritance – Polymorphism – Abstract Classes and Methods – Overloading and Overriding – Pure Polymorphism – Operator instance of and Down Casting – Final Methods and Classes – Clone class – Multithreading – Files and Streams – Formatted Output – Object Concurrency – Serialization – Generic Collections – Generic Classes and Methods – Applets – Frameworks.

**UNIT – II: DATA STRUCTURES AND DESIGN AND ANALYSIS OF ALGORITHMS**

Arrays - Lists – Singly and Doubly linked lists – Stacks – Queues – Insert, Delete and Search operations – Trees – Binary Trees – Binary Search Trees – Representation, Insert, Delete, Traversal – AVL Trees, Heaps – Priority Queues – Graphs – Representation, Traversals – Hashing Algorithms – Growth of Functions – Asymptotic Notation,  $O$ ,  $\Omega$ ,  $\theta$  – Solving Recurrence Equations – Algorithms Strategies – Divide and Conquer – Quicksort, Merge Sort, Binary Search – Dynamic Programming – Warshall and Floyd's algorithms – Greedy Strategy – Minimum Spanning Tree – Shortest Path Algorithm – String Matching algorithms – Naïve, Knuth Morris Pratt – NP Problems – NP Complete – NP Hard – Reducibility – Vertex Cover, Hamiltonian Cycle – Travelling Salesperson Problem – Approximation algorithms.

**UNIT-III: DIGITAL LOGIC, COMPUTER ORGANIZATION AND COMPUTER ARCHITECTURE**

Boolean Algebra and Logic Gates – Combinational Logic – Sequential logic – Functional Units of a Digital Computer – Instruction Set Architecture – RISC and CISC Architectures – Data path and Control – Hazards – Structural, Data and Control Hazards – Dynamic Scheduling – Speculation – ILP and Thread Level Parallelism – Arithmetic – Addition and Subtraction – Binary Multiplication – Binary Division – Floating Point Numbers – Cache Memories – Virtual Memory – Associative memories – Accessing I/O devices – Interrupts - Direct Memory Access – Interface Circuits.

## **UNIT – IV: OPERATING SYSTEMS AND SYSTEM SOFTWARE INTERNALS**

Evolution of OS-Virtual Machines – multiprocessor and multi core. Process states – description, control-execution of OS-Security issues. Threads - Types of threads, multi core and multithreading. Uni and multiprocessor scheduling, real time scheduling. Mutual exclusion, semaphores, monitors, message passing, reader-writer problem. Deadlock prevention, avoidance, detection, integrated deadlock strategy, dining philosopher's problem. Address binding, logical versus physical address space, dynamic loading and linking, shared libraries, overlays, swapping, contiguous memory allocation, paging, segmentation-Demand paging, process creation, page replacement, frame allocation, thrashing-I/O devices, Organization of I/O function, I/O buffering, disk scheduling. File Management. Access and organization, file directories and sharing, secondary storage management. Linux Systems. One and Two Pass Assemblers – One and Two Pass Loaders, Linkers – One pass Macroprocessors and Emulators – Virtual Machines – Object Oriented VMs – Java VM Architecture – Profiling – Migration – Grids.

## **UNIT – V: DATABASE MANAGEMENT SYSTEMS**

Database Applications – Data Models – Database Architecture – Key issues and Challenges in Database Systems – ER Models – ER to Relational Mapping – Object Relational Mapping – Relational Model – Constraints – Keys – Dependencies – RelationalAlgebra – Normalization – First, Second, Third & Fourth Normal Forms – BCNF – JoinDependencies – SQL – Embedded & Dynamic SQL – Data Constraints – Database Security – Transaction Systems – ACID Properties – System & Media Recovery – Concurrency – Lacking Protocols – Log Based Recovery – Two Phase Commit Protocol -Recovery – Deadlocks & Managing Deadlocks – Indexing & Hashing Techniques – Query Processing & Optimization – Sorting & Joins – Database Tuning – Data Mining and Warehousing.

## **UNIT – VI: SOFTWARE ENGINEERING**

Software life-cycle and process models; Process assessment models; Project management activates. Requirements elicitation and analysis; Functional and non-functional requirements; User and system requirements, Requirement validation and specification. Design principles; System Models-Context, Behavioural, Data and object models, Architectural design-system structuring, Control models; Structured and object- oriented design; User interface design; Verification and validation planning; Test plan creation and test case generation; Black-box and White-box testing techniques; Unit, integration, validation and system testing; Object-oriented testing; Software inspections. Software maintenance; Reengineering; Legacy systems; Software reuse. Roles and responsibilities in a software team, Project Planning and Scheduling; Software measurement and estimation; Risk analysis and management; Quality management; Configuration management. Quality assurance and Process Improvement; ISO 9000, CMMI, TQM and Six Sigma; programming environments; Project management tools; Requirements analysis and design tools; Testing tools; Configuration management tools; CASE tools.

### **UNIT - VII: COMPUTER NETWORKS AND SECURITY**

ISO/OSI Model – HTTP – FTP – Telnet – Email – DNS – Application Performance. User Datagram Protocol (UDP) – Reliable Data Transfer – Transmission control Protocol (TCP) - Flow Control – Congestion Control. Internet Protocol – IPV4 Packet Format – IP Addressing – Subnetting – Classless Inter Domain Routing (CIDR) – BOOTP/DHCP-ICMP – Routing Principles – Distance Vector Routing (RIP) – Link State Routing (OSPF) – Path Vector Routing (BGP). Framing – Addressing – Error Detection/ Correction – Multiple Access Protocols – Address Resolution Protocol (ARP) – Ethernet Basics – CSMA/CD – Frame Format – Switching – Types (datagram, virtual) – Wireless LAN (802.11). Encryption Techniques – DES – Modes of operation – Triple DES – AES – RSA - Attacks. Diffie – Hellman key exchange – Elliptic curve cryptography key exchange – Message Authentication codes – Hash functions – Digital Signatures. Kerberos – X.509 – PGP, S/MIME-IP Security – Web Security – SSL, TLS, SET – System security.

### **UNIT – VIII: EMBEDDED SYSTEMS**

Embedded System design process, Embedded processors – ARM Processor – Architecture, ARM and Thumb Instruction sets – Embedded C Programming – Looping Structures – Register Allocation – Function calls – Pointer aliasing – Structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues. Profiling and cycle counting – instruction scheduling – Register allocation – Conditional execution – looping constructs – bit manipulation – optimized primitives. Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Exception and interrupt handling – Performance issues. Meeting real time constraints – Multi-state systems and function sequences – Embedded software development tools – Emulators and debuggers – Design methodologies.

### **UNIT – IX: CLOUD COMPUTING AND VIRTUALIZATION**

Cloud Components, Infrastructure, Architecture, Applications, Benefits, Limitations, Cloud Deployment Models, Cloud Technologies. Infrastructure as a Service (IaaS) – Storage as a Service – Compute as a Service – Platform as a Service (PaaS) – Software as a Service (SaaS) : CRM as a Service, Social Computing Services, Document Services. Taxonomy, Server Virtualization, Desktop Virtualization, Network Virtualization, Storage Virtualization, Hypervisor. Hardware and Infrastructure – Server, Clients, Network, Services. Accessing the Cloud-Web Applications, Web API, Web Browsers. Scalable data storage techniques. Map reduce Framework – Hadoop, HDFS. Cloud Security: Requirements, Security Threats, Cloud Security Mechanisms. Scalability, Availability, Migration, Security, Network Congestion, Leasing and Billing, on-demand allocation problems.

**UNIT – X: WEB TECHNOLOGY AND MOBILE COMPUTING**

Internet and WWW Protocols, Client side Programming: HTML, CSS, JavaScript, XML, DTD, Schema, XSLT, server side Programming: Python, PHP, Web Servers: configuration, security, Core Java: I/O, AWT, Network Programming, RMI, JDBC, Applets, Swing, Advanced Java: JSP, Servlets, Beans, MVC. Web Frameworks: sessions, user management, legacy databases and applications, Web Application development. Web Services: SOAP, UDDI, WSDL. Pervasive Computing – Architecture and Applications – Smart devices and operating systems, secure services – Mobile Applications: Mobile Ecosystem – Medium Access and Telecommunications: Frequencies – Signals – Antennas – Signal propagation – Media Access Control – Protocols, Localization and calling, Handover – GPRS. Wireless Networks: Infrastructure and ad hoc networks – WLAN, IEEE 802.11 standards protocols. Piconet – Bluetooth – architecture and services. Mobile IP – DHCP – Routing in Mobile ad hoc networks.

**ELECTRICAL ENGINEERING**  
**(DEGREE STANDARD)**

**Subject Code: 259**

**UNIT – I: ELECTRICAL CIRCUITS**

Circuit elements – Kirchoff's Laws – Mesh and Nodal Analysis - Network Theorems and Applications for DC and AC circuits: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem – Sinusoidal Steady State Analysis of RL-RC-RLC Circuits- Resonant Circuits - Natural and Forced Response – Transient Response of RL-RC-RLC Circuits-Two-port networks – Three Phase Circuits.

**UNIT – II: ELECTRIC AND MAGNETIC FIELDS**

Coulomb's Law-Electric Field Intensity-Electric Flux Density-Gauss's Law- Divergence - Electric Field and Potential due to Point, Line, Plane and Spherical Charge Distributions - Effect of Dielectric Medium - Capacitance of Simple Configurations. Magnetic Circuits- Magnetomotive force - Reluctance-Faraday's laws-Lenz's law - Biot- Savart's law - Ampere's law - Fleming's Left and Right Hand Rule-Lorentz force - Inductance - Self and Mutual Inductance-Dot Convention-Coupled Circuits

**UNIT – III: MEASUREMENTS AND INSTRUMENTATION**

Units and Standards – Static and Dynamic Characteristics-Types of Errors-Error Analysis - Measurement of Current, Voltage, Power, Power-factor and Energy – Indicating instruments – Measurement of Resistance, Inductance, Capacitance and Frequency – Bridge Measurements – Instrument Transformers-Electronic Measuring Instruments – Multi meters-True RMS meter-Spectrum Analyzer-Power Quality Analyser- Recording Instruments-X-Y Recorder-Magnetic Recorders-Digital Data Recorder-Oscilloscopes-LED and LCD Display-Transducers and their applications to the Measurement of Non-Electrical Quantities like Temperature, Pressure, Flow-rate, Displacement, Acceleration, Noise level -- Data Acquisition Systems – A/D and D/A Converters- Data Transmission Systems.

**UNIT – IV: CONTROL SYSTEMS**

Mathematical Modelling of Physical Systems – Transfer Function - Block Diagrams and Signal Flow Graphs and their Reduction using Mason's Rule – Time Domain and Frequency Domain Analysis of Linear Time Invariant (LTI) System – Errors for Different Type of Inputs and Stability Criteria for Feedback Systems – Stability Analysis Using Routh-Hurwitz Array – Nyquist Plot and Bode Plot – Root Locus – Gain and Phase Margin Basic Concepts of Compensator Design – PI, PD and PID Controllers-State Variable Matrix – System Modeling and Design – Sampled Data System – Stability of Sampled Data System.

**UNIT –V: ELECTRICAL MACHINES**

D.C. Machines – Construction, Excitation methods – Armature Reaction and Commutation - Characteristics and Performance Analysis – Generators and Motors – Starting and Speed Control – Testing – Losses and Efficiency. Transformers-Types-Construction and Operation- Testing – Equivalent Circuits – Losses and Efficiency-All day efficiency – Regulation – Parallel Operation – Three Phase Transformers – Auto-transformer.



Induction Machines – Construction, Principle of operation – Rotating Magnetic Field – Performance, Torque-Speed Characteristics, No-load and Blocked Rotor tests, Equivalent Circuit, – Starting and Speed Control – Single-Phase Induction Motors – Linear Induction Motors – Hysteresis Motors – Reluctance Motors.

Synchronous Machines – Construction – Operating characteristics and Performance analysis – Efficiency and Voltage regulation – Parallel operation – V and inverted V curves of synchronous motors – Power factor improvement-BLDC Motor.

### **UNIT –VI POWER SYSTEMS**

Single Line Diagram of Power System-Per Unit Quantities-Power Generation Types– Hydro, Thermal and Nuclear Stations – Pumped storage plants – Co generation– Economic and operating factors – Modelling and performance characteristics of Power transmission lines and Cables-HVDC transmission– Mechanical Design of Transmission Lines-Sag-Insulators - ZBus and YBus formulation - Load flow studies -- Shunt and Series Compensation- Symmetrical and Un symmetrical Faults Analysis - Transient and Steady- State Stability of Power Systems – Equal Area Criterion-Voltage and Frequency Control – Power System Transients – Power System Protection – Circuit Breakers – Relays –AC and DC Distribution.

### **UNIT –VII ANALOG AND DIGITAL ELECTRONICS**

Semiconductor Devices – PN junctions – Transistors – FET – Zener, Photo diodes and their applications – Rectifier circuits – Voltage regulators – Multipliers.

Biasing circuits – Small signal amplifiers – Frequency response – Multistage amplifiers – Coupling methods – Large signal amplifiers – Push-pull amplifiers – Feedback amplifiers – Oscillators – Operational amplifiers and its applications – Precision rectifiers – Multivibrators - Voltage Controlled Oscillator-Timer.

Digital logic gate families (DTL,TTL,ECL,MOS,CMOS) – Logic gates - Simplification of Logic Functions- Design of Combination circuits - Sequential logic circuits-latch-Flip- flops– Counters – Registers – Memories(ROM,PLA and FPGA).

### **UNIT - VIII POWER ELECTRONICS AND DRIVES**

Power Semiconductor devices – Ideal and practical attributes of switch - Power Diode-DIAC - SCRs-TRIAC-GTO - power MOSFET-IGBT- Static Characteristics and Principles of Operation\_ Single and Three Phase AC to DC Converters – Single and Three Phase AC to AC converters –DC to DC Converters (MOSFET and IGBT based) - Single and Three Phase Inverters (MOSFET and IGBT based) - Pulse Width Modulation – Sinusoidal Modulation with Uniform Sampling – Uninterrupted Power Supplies-Switched Mode Power Supplies – Speed Control of DC and AC Motor Drives– Applications of Variable Speed Drives.

### **UNIT –IX DIGITAL PROCESSORS AND COMMUNICATION**

Architecture of 8085, 8086 and 8051 – Instruction Sets – Assembly Language Programming – Interfacing for memory and I/O: 8255 Programmable Peripheral Interface – 8253 Programmable Timer Interface – 8279 Programmable Keyboard and Display Interface – 8257 Direct Memory Access Interface - Embedded processors (ARM and PIC basics only).

Classification of Signals – Properties of Discrete Fourier Transforms - FFT Computation –FIR Filters – IIR Filters: Butterworth Filters – Chebyshev Filters. **Digital Communication Systems:** Pulse Code Modulation and Demodulation – Adaptive Delta Modulation - Frequency Division and Time Division Multiplexing – Data Communication Network Topologies - 7-layer OSI Protocol.

### **UNIT –X RENEWABLE ENERGY SOURCES AND STORAGE DEVICES**

Renewable Energy – Sources and Features - Solar Radiation Spectrum- Radiation Measurement-Solar Photovoltaic Cell -Operating Principle- Microhydel- Operating principle- Wind Energy Source- Wind Patterns and Wind Data- Site Selection-Types of Wind Generators-Fuel Cells-Batteries-Super Capacitors.

**ELECTRONICS / ELECTRONICS AND COMMUNICATION ENGINEERING**  
**(DEGREE STANDARD)**

**Subject Code: 304**

**UNIT - I: SEMICONDUCTOR THEORY AND ELECTRONIC DEVICES**

Intrinsic and extrinsic semiconductors, Energy Band Diagrams, Diffusion and Drift current densities, Hall effect. PN junction diode, current equation, Transition and Diffusion capacitances, Zener diode, Tunnel diode, Varactor diode, Photo diode, Schottky diode, LED, BJT, FET, JFET, MOSFET, SCR, UJT, TRIAC, IC fabrication.

**UNIT - II: CIRCUIT THEORY, SIGNALS AND SYSTEMS**

Kirchoff's laws, Nodal and Mesh analysis, Network theorems: Superposition, Thevenin, Norton, Maximum Power Transfer, Miller; Delta-Wye conversion, Transients and resonance in RLC circuits, Magnetically coupled circuits, Mutual inductance.

Continuous and Discrete time signals, Energy and power signals, Fourier series, Fourier transform analysis of continuous time signals and systems, Laplace transform analysis, Convolution integral, DTFT and Z transform analysis of discrete time signals and systems, Convolution sum, Recursive and Non-recursive systems, Sampling Theorem.

**UNIT - III: ANALOG ELECTRONIC CIRCUITS**

BJT, JFET, MOSFET amplifiers: Biasing analysis, Small signal analysis and frequency response, BJT and MOSFET Multistage amplifiers: Differential, Darlington, cascode and cascade; Feedback amplifiers, Tuned amplifiers, RC and LC oscillators, Power amplifiers. Rectifiers and wave shaping circuits, Operational Amplifier characteristics and applications, CMRR, Slewrate, Waveform generators, Active filters, Timers, PLL, VCO, ADC, DAC, Regulators and Converters.

**UNIT - IV: CONTROL SYSTEMS AND INSTRUMENTATION**

Control system components, feedback, transfer function, transient and steady analysis of LTI systems, Frequency response, Bode, Polar, Nyquist plots, Routh-Hurwitz and Nyquist stabilities, Lag, Lead, Lag-lead compensation, State variable model.

**UNIT - V: ELECTRONIC COMMUNICATION**

AM, FM, PM modulation and demodulation, Superheterodyne receiver, AGC, PAM, PWM and PPM, Entropy, Mutual information, Channel capacity, PCM, DPCM, ADPCM, DM, ADM, Source encoding techniques, TDM and FDM, line coding techniques, ASK, FSK, PSK, QPSK, QAM – Bandwidth, SNR, BER, Error Probability, Eye Diagram, Bandpass Sampling, clock and carrier synchronization, Error control coding, Spread spectrum modulation methods.

**UNIT - VI: ELECTROMAGNETIC FIELDS AND ANTENNAS**

Theorems: Divergence, Stokes, Coulomb; Poisson and Laplace Equation, Ampere's law, Biot-Savort law, Gauss law for magnetic fields, Maxwell's equations, Displacement current, Uniform plane waves, Polarization, reflection and refraction of plane waves at different boundaries, Poynting vector.

Transmission line equation, Characteristic impedance, impedance matching, Smith chart, Attenuators and Equalizers, Lattice diagram, TE, TM and Tem waves, Rectangular guides, Dielectric slab wave guides, TE and TM wave in circular guides, Cavity resonator and Qfor dominant mode.

Antennas: Dipole, Horn, Reflector, Slot, spiral, logperiodic microstrip; Broadside and End fire array, adaptive array, antenna gain, radiation pattern, polarization, VSWR, Radiowave propagation.

### **UNIT – VII: COMMUNICATION SYSTEMS**

Wireless Link budget, Wireless channel characteristics: coherence bandwidth, Doppler spread; Flat, Frequency selective, Fast and slow fading; FDMA, TDMA, CDMA, Capacity calculation, Frequency reuse, Channel assignment, Handoff, trunking and grade of service. Minimum shift keying Gaussian Minimum shift keying, OFDM, cyclic prefix, PAPR, Adaptive equalization, Diversity, Rake receiver, MIMO Systems, Beam forming, Capacity in fading and non-fading channels.

Microwave signal generation: Klystron, Magnetron, TWT, GUNN Diode, IMPATT, TRAPATT; Devices: Directional Coupler, T Junctions, Isolator, Circulator, Couplers, Iris, Probes. Microwave transistors – Stability analysis, Microwave measurements – power, VSWR, Frequency, Dielectric constant.

Light Propagation in optical fibres, Ray and mode theory, Fibre structure, Fibre materials, merits of optical fibre communication, Fibre attenuation and dispersion characteristics, Materials for optical sources, LED and LASER Diodes, Optical detection, PIN and Avalanche Photo diodes, WDM Concept, optical networks.

Satellite orbits – Kepler's laws, Geostationary satellite, transponders, GPS receiver DBS/DTH.

OSI/TCP/IP model - functions and protocols of layers, Routing algorithms, Congestion control algorithms, MAC Protocols.

### **UNIT – VIII: DIGITAL SIGNAL AND IMAGE PROCESSING**

DFT, FFT, Overlap and save methods, Butterworth and chebyshev filters, impulse invariant and bilinear transform methods, realization structures, FIR design methods, product quantization, limit cycle oscillations, scaling, Decimation and interpolation, multirate signal processing.

Brightness, Contrast, Hue, Saturation, RGB, HSI Models, Mach band Effect, Image sampling, DCT, Histogram Equalization, Mean and median filters, Region growing segmentation, JPEG standard.

### **UNIT – IX: VLSI AND EMBEDDED SYSTEMS**

CMOS inverter, Combinational logic circuits, Elmore's Constant, Pass transistor logic, Power dissipation, static and dynamic registers. Clock strategies, synchronous and Asynchronous Circuits, Adders and multipliers, PLA, PAL, FPGA.

Architecture and instruction set of 8085, 8086 and 8051, assembly language programming. Microprocessor based systems. ARM processor family – architecture, Multiple tasks, multiprocesses and multiprocessors. Scheduling, power optimization strategies, I2C, CAN bus.

### **UNIT – X: COMPUTER ENGINEERING**

Number systems, Boolean algebra, Karnaugh map, logic gates, Adders, magnitude comparator, Decoder, Encoder, Mux, Demux, Flipflops, Counters, shift register, Synchronous sequential circuits, Asynchronous sequential circuits, ROM, EPROM, EEPROM.

Fundamentals of Computer architecture, Data path and control unit design, RAM, Optical, Cache and Virtual Memories, Memory allocation, Associative memory, DMA, interrupts, RISC and CISC processors.

**MECHANICAL ENGINEERING**  
**(DEGREE STANDARD)**

**Subject Code: 256**

**UNIT– I: Mechanics, Kinetics and Dynamics:**

Statics of Particles, Equilibrium of Rigid bodies, Properties of Surfaces and Solids, Dynamics of Particles, Friction and Elements of Rigid Body Dynamics, Basics of Mechanisms, Kinematics of mechanisms, gyroscope, Gears and Gear Trains, Friction in Machine Elements, Force Analysis, Balancing, Single Degree Free Vibration, Forced Vibration, mechanisms for Control and Vibration.

**UNIT– II: Strength of Materials and Design:**

Stress, Strain and Deformation of Solids, Transverse Loading on Beams and Stresses in Beams, Torsion, Deflection of Beams, Energy Principles, Thin Cylinders and Thick Cylinders, Spherical Shells, Fundamentals of Design for Strength and Stiffness of Machine Members, Design of Shafts and Couplings, Design of Fasteners and Welded Joints, Design of Springs, Design of Bearings, Design of Flywheels, Design of Transmission Systems for Flexible Elements, Spur Gears and Parallel Axis Helical Gears, Bevel Gears, Worm Gears and Crossed Helical Gears, Design of single and two stage speed reducers, Design of cam, Clutches and Brakes.

**UNIT – III: Fluid Mechanics and Turbo Machinery:**

Fluid properties, fluid statics, manometry, buoyancy, control volume analysis of mass, momentum and energy, fluid acceleration, differential equations of continuity and momentum, Bernoulli's equation, viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends etc.

Turbomachinery: Pelton wheel, Francis and Kaplan turbines - impulse and reaction principles – velocity diagrams.

**UNIT – IV: Thermodynamics:**

Basic concepts, Zeroth, First and Second laws of thermodynamics, thermodynamic system and processes, Carnot cycle. irreversibility and availability, behaviour of ideal and real gases, thermodynamic relations, properties of pure substances, calculation of work and heat in ideal processes, analysis of thermodynamic cycles related to energy conversion, Fuel and combustion.

**UNIT – V: Heat and Mass Transfer:**

Modes of heat transfer one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes thermal boundary layer effect of turbulence radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Basic Concepts of Mass transfer, Diffusion Mass Transfer, Fick's Law of Diffusion Steady state Molecular diffusion, Convective Mass Transfer, Momentum, Heat and Mass Transfer Analogy, Convective Mass Transfer Correlations.

Applications: Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychometric chart, basic psychometric processes.

### **UNIT – VI Materials Science and Metallurgy:**

Constitution of alloys and phase diagrams, steels, cast iron, TTT diagram, heat treatment of ferrous and non-ferrous metal, surface modification techniques, non-metallic materials, mechanical properties and testing, crystal defects and strengthening mechanisms, conducting and semi conducting materials, magnetic and dielectric materials, Engineering ceramics, Engineering and commodity polymers, composites.

### **UNIT – VII Production Technology:**

Foundry Technology- types of pattern, moulding and casting methods, design of castings, defects, Hot and Cold working, metal forming processes- types and defects, metal joining processes, types and design of weldment, welding metallurgy, welding defects, Metal cutting, machine tools - center lathe, drilling, milling, grinding, gear cutting and broaching, unconventional machining processes, CNC machine tools, Part programming.

### **UNIT – VIII Metrology and Quality control:**

Linear and angular measurements, Interferometry, laser interferometers , Types, Computer Aided Inspection, Basic concept of CMM- Types of CMM, Machine vision, Form measurement-Straightness- Flatness, Roundness, Surface finish measurement, contact and non contact method, Measurement of power, flow and temperature.

Statistical quality control, control charts, acceptance sampling, reliability, TQM, 5S, ISO standards.

### **UNIT - IX CAD / CAM / CIM / FEA:**

Fundamentals of Computer Graphics, Geometric Modeling, Visual Realism, Assembly of Parts, CAD Standards, Fundamentals of CIM, Production Planning and Control and Computerized Process Planning, Cellular Manufacturing, Flexible Manufacturing System and Automated Guided Vehicle System, Industrial Robotics, Additive manufacturing, Just in Time(JIT), lean manufacturing, One Dimensional Problems in FEA, Two Dimensional Scalar Variable Problems, Two dimensional vector variable Problems, Isometric Parametric Formulation.

### **UNIT – X Industrial Engineering and Management:**

Work study - techniques, Method study - objectives - basic procedure, work measurement - objectives - basic procedure, machine loading and scheduling, product sequencing, inventory control - E O Q - quantity discounts, ABC Analysis material handling systems, operations research, simplex method, Transportation model, Assignment model CPM and PERT.

Management theory and practice, planning - nature and purpose of Planning, Decision making, Organising, staffing, Motivation, Leadership, controlling, control techniques.

**COMPUTER APPLICATIONS**  
**(DEGREE STANDARD)**

**UNIT - I: BASIC MATHEMATICS****Subject Code: 288**

Propositional logic sets, relations, functions, partial orders, matrix, algebra, integration, differentiation.

**UNIT - II: DIGITAL COMPUTER FUNDAMENTALS**

Number systems - Decimal, Binary, Octal, Hexadecimal - Conversion from one to another - Characters and codes - ASCII code, Excess-3 code, gray code - Binary addition, subtraction, multiplication and division - Unsigned binary numbers - Signed magnitude numbers - Complements in number systems - Truth tables, AND, OR, NOT, NOR & NAND gates, EX-OR gates - Parity generators and checkers.

**Boolean Algebra and Digital Circuits** : Boolean laws and theorems - De Morgan's theorems - Duality theorem - Simplification of sum of 2 product and product of sum expressions - Karnaugh map and simplifications - Simple arithmetic circuits - Half and Full adders - Binary adder/subtractor - BCD adder - Data processing circuits - Multiplexers - Demultiplexers - Encoders and Decoders.

**Operating Systems:** Types - Scheduling algorithms, Memory Management - Requirements - Partitioning - Paging - Segmentation - Virtual memory

**UNIT - III: PROGRAMMING IN C AND C++**

Data Types - Variables - Operators - Control structures - Looping structures - Arrays - Strings - Built-in-functions. Function - Scope of Variables - Advanced features of functions. Pointer - Pointers to Array - Pointer Array - Pointer Arithmetic - Pointer of Pointer - Functions and Pointers - Structures and Pointers - Dynamic Allocation - Function pointer.

**C++:** Objects - Classes - Inheritance-reusability - Creating new data types - Polymorphism and overloading.

**UNIT - IV: MANAGEMENT INFORMATION SYSTEMS**

Fundamentals of Information System – Overview of Information of System Solving Business Problems with Information Systems : System Approach to Problem Solving – Developing Information System Solution – Information Systems for Strategic Advantages – Fundamentals of Strategic Advantage - Strategic Applications and Issues in It; Managing IT : Enterprise and Global Management.

**Business applications of Information Technology:** The Internet and Electronic Commerce – Fundamentals of Electronic Commerce – Information System for Business Operations: Business Information System – Transaction – processing Systems. Information systems for Managerial Decision Support : Decision Support Systems – Artificial Intelligence technology in Business – Managing IT – Planning for Business change with IT – Implementing business change with IT – Security & Control Issues in I/S - Ethical and societal challenges of Information Technology.

**UNIT - V: COMPUTER NETWORKS**

Introduction to Computer Networks and Data Communication: Need for computer

networks - evolution - Data Communication - Data Transmission - Transmission media - Classification of Networks - Switching and Routing - Routing - Multiplexing and Concentration Concentrator - Terminal Handling - Components of a Computer Network. Network Standards and OSI - Need for network standard - OSI reference model - Physical layer - Data link layer - Network layer - Transport layer - Session layer - Application layer.

### **UNIT - VI: FUNDAMENTALS OF DATABASES**

Early Information Systems - Problems with Early Information Systems - Organization of Data Base - Components of Data Base Management System-Data Models - Entity -Relationship Model - Network Data Model, Hierarchical Data Model - Semantic Data Modelling. File Organization - Sequential file organization - The indexed sequential file organization -Creation and manipulating of indexed sequential file - Hashing - Key-to- address transformation. Relational Data Model: Introduction - Basic definition and terminology - Relational algebra.

### **UNIT - VII: OFFICE AUTOMATION**

Features of MS – Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

**Editors and Word Processors:** Basic Concepts, Examples: MS-Word, Introduction to desktop publishing.

**Spreadsheets and Database packages :** Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-Power Point.

### **UNIT - VIII: MULTIMEDIA AND APPLICATIONS**

Uses of Multimedia – Introduction to making multimedia – Multimedia skills. Multimedia hardware and software – Connections – Memory and storage devices – Input devices – Output devices – Communication devices. Basic software tools – Text editing and word processing tools – Painting and drawing tools – 3-D modelling and animation tools – Image editing tools – Animation, video and digital movie tools. Making instant multimedia – Multimedia authoring tools. Multimedia Building Blocks – Text – Sound – Multimedia System Sounds – MIDI versus Digital Audio – Digital Audio – Making MIDI Audio – Audio File Formats – Production tips - Images – Animation - Video.

### **UNIT - IX: WEB TECHNOLOGIES**

**The world wide web:** Browsing the Web - Web address - Web browser basics - Strong and managing(book marks) - Surfing the web with web browser - Searching the web directory - Search engines - Navigation tools.

**Email:** Sending - Reading - Replying - Deleting - Exiting - Sending Mail to more than one person sending folder - Forwarding a mail - Checking the spelling - Attachments. **HTML:** Overview of HTML - Adding structure to a page formatting text and pages - Linking page to the world - Including picture - Clearing lists - Arranging items within tables - Getting feedback from form - Splitting a page into frames.



**UNIT - X: ORGANIZATIONAL BEHAVIOR**

Organizational Behaviour models, Foundation of individual Behaviour, Concept of Attitude, Concept of value, concept of JOB Satisfaction learning theories, Foundation of GROUP BEHAVIOUR – reasons for GROUP formation by people, Leadership concept.

**COMPUTER SCIENCE**  
**(DEGREE STANDARD)**

**Subject Code: 286**

**UNIT - I: MATHEMATICAL FOUNDATIONS**

Propositional logic sets, relations, functions, partial orders and lattices, regular and contextfree languages, finite state machines and pushdown automata.

**UNIT - II: COMPUTER ORGANIZATION**

Function organization, machine instructions, addressing modes, introduction to microprocessors, study of 8085/8086 communication between processor and I/O via DMA and interrupt priority, I/O processors, problems associated with bus scheduling. Micro computer memory, virtual memory, basic concepts, problems of virtual memory, page replacements algorithms, cache memory, associative memory.

Fundamentals of parallel processing and its necessity pipelined processors and multiprocessors.

**UNIT - III: DATA STRUCTURES IN C**

Data types, control statements, procedures, Scope rules, arrays and records, enumerated data types, sets, pointers, recursion. Sequential, indexed files, sorting and merging report generations. Arrays, queues, linked lists, stacks, tree traversal, evaluation of expressions using postfix notation, sorting algorithms, bubble sort, quick sort, heap sort, complexity of algorithms.

**UNIT - IV: SYSTEMS SOFTWARE**

Editors, loaders, linkers, assemblers, phases of a compiler and their function, lexical analysers and parsers, parsing techniques, symbol table, code generation.

Batch, Multi-programming and time sharing systems, processor memory, device and file management, virtual memory, process scheduling, inter process communication, I/O redirection, process synchronization and concurrency, deadlocks, prevention, avoidance, detection and recovery, auxiliary storage management, file system functions and its hierarchy.

**UNIT - V: DATABASE SYSTEMS**

File organisation techniques: indexing, relational and network data models, study of ORACLE as a relational DBMS. Data dictionary, normal forms and query languages.

**UNIT - VI: COMPUTER NETWORKS**

Data communication concepts, concepts of LAN, evolution of LAN, OSI - 7 layer reference model and design issues. Physical layer-transmission media, packet and circuit switching, topologies, Data link layer, token passing, sliding window protocols, protocols specification and verification, network layer, routing, congestion control, transport layer, session and presentation layers, design issues, application layer, file transfer, electronic mail.

### **UNIT - VII: SOFTWARE ENGINEERING**

Systems analysis, detailed analysis, feasibility study, tools for system designer, input and output design, program definition, module design and design review, structured programming and conversion, testing, training and documentation, systems life cycle, role of System Analyst. Tools for office Automation, word processing Spreadsheets, Financial and Statistical packages, payroll, inventory, picture generation and display in computers, Multimedia systems, Application of computers in Government, Defence, Agriculture, Medicine and Education.

### **UNIT - VIII: COMPUTER GRAPHICS**

Introduction – Point plotting techniques – Line drawing displays – Two dimensional displays – Clipping and Windowing. Graphics package – Segmented display files – Display file compilation – Geometric models – Picture structure. Graphical input units – graphical input techniques – Event handling – Input functions. Raster graphics fundamentals – Solid area scan conversion – Interactive raster graphics – Raster graphics systems – Raster display hardware. Two dimensional and three dimensional transformations.

### **UNIT- IX: OBJECT ORIENTED PROGRAMMING (C++ & JAVA)**

C++ and Java programming, objects and data, derived types, loops and relational expressions, branching statements and logical operators, functions, objects and classes, operator overloading, conversion of functions, dynamic memory and classes, class inheritance, input/ output and files, benefits of OOP, object oriented system development tools.

### **UNIT- X: WEB TECHNOLOGIES**

**The world wide web:** Browsing the Web - Web address - Web browser basics - Strong and managing(book marks) - Surfing the web with web browser - Searching the web directory - Search engines - Navigation tools.

**Email:** Sending - Reading - Replying - Deleting - Exiting - Sending Mail to more than one person sending folder - Forwarding a mail - Checking the spelling - Attachments. **HTML:** Overview of HTML - Adding structure to a page formatting text and pages - Linking page to the world - Including picture - Clearing lists - Arranging items within tables - Getting feedback from form - Splitting a page into frames.

**ENVIRONMENTAL SCIENCE**  
**(DEGREE STANDARD)**

**Subject Code: 298**

**UNIT – I: SCOPE AND IMPORTANCE OF ENVIRONMENTAL SCIENCE**

Definition; multidisciplinary nature of environmental science, scope and importance; global environmental problems; components of environment: biotic, abiotic. Atmosphere. Lithosphere: case study on major geological formations in Tamil Nadu; Hydrosphere case study on major river systems in Tamil Nadu.

**UNIT- II: ECOLOGICAL CONCEPTS**

Ecosystem definition; structure and function; energy flow, food chain and food web; ecological pyramids, biogeochemical cycles (Carbon, Nitrogen and Phosphorus); Hydrological cycle; ecosystem types: ponds, ocean, river, cropland, wetland, desert, forests and grassland; ecological succession; primary, secondary and tertiary producers. Examples of plant and animal adaptations for arid (desert and semi-desert) and humid (rain forest) biomes.

**UNIT – III: ENVIRONMENTAL RESOURCES**

Non-renewable resources - Mineral use and exploitation; fossil fuels. Renewable resources: water – surface and ground water, supply, demand, dams-benefits and problems; soil and land resources – Structure, formation, erosion, conservation of soil, agricultural practices, land use, land degradation, desertification; Fisheries – inland and marine fisheries, aquaculture, overharvesting. Forest resources – Timber, medicinal plants, fuel-wood, deforestation, forest management. Management of renewable and non- renewable resources; sustainable use.

**UNIT- IV: BIODIVERSITY AND CONSERVATION**

Biodiversity - Definition; Introduction to genetic, species and ecosystem diversity; biogeographical classification of India: Forest types of Tamil Nadu: tropical dry evergreen, thorny scrub, wet evergreen forests, grasslands, sholas, dry and mixed deciduous forests, mangroves. Coral reefs. Agro-biodiversity, land races and genetic resources. Valuation of biodiversity; Consumptive, productive, cultural value. Threats to biodiversity: habitat loss, poaching, over-utilisation, invasive species. Endemic and threatened species of Tamil Nadu. In situ conservation: Mudumalai, Anamalai and Kalakad-Mundanthurai Tiger Reserves, Gulf of Mannar Marine Reserve, Pulicat and Pt. Calimere Wildlife Sanctuaries; sacred groves. Ex-situ conservation: Vandalur Zoological Park and Madras Crocodile Bank. Red data book, National Biodiversity Act, Wildlife Protection Act (1972), Tamil Nadu Forest Conservation Act.

**UNIT- V: HUMAN POPULATION AND ENVIRONMENT**

Population growth and regulation: Age pyramids, Malthusian theory, global trends of population growth, variation among nations and zero population growth. Environmental health, Nutrition and health. Communicable diseases such as typhoid, cholera, tuberculosis, hepatitis, influenza, HIV- social issues. Non-

communicable diseases such as heart disease, diabetes, asthma. Epidemics. Environmental risk factors. Human displacement and rehabilitation, tribal population and welfare schemes, women and child welfare; Human rights, Intellectual Property Rights.

### **UNIT- VI: NATURAL CATASTROPHIES AND DISASTER MANAGEMENT**

Causes and effects of natural catastrophies – Earthquakes, floods, cyclones, hurricanes, storms, landslides, drought, famine, tsunami; pre-disaster and post - disaster management, risk assessment, early warning systems and forecasting. Role of administrators, scientists, planners, volunteers.

### **UNIT- VII: ENVIRONMENTAL POLLUTION**

Definition of pollution and pollutants; types of pollution - Air, water, soil, noise, thermal, nuclear; causes of pollution, effects of pollution and control measures; liquid and solid waste management, nuclear holocausts. Case studies: leather industry, fly ash, thermal stations, nuclear power plants.

### **UNIT- VIII: ENVIRONMENTAL MANAGEMENT AND LEGISLATION**

Environmental Impact Assessment (EIA) : Objectives, Principles of Process, screening of projects, methodologies, checklist and documentation, prediction methodologies, public participation, limitation of EIA ; Environmental Protection Acts in India : air, water. Lake and River action programmes; coastal zone management; pollution control boards, Management plans using Geographic Information System (GIS) and Remote Sensing (RS) tools.

### **UNIT - IX: ENVIRONMENTAL ORGANISATIONS AND AGENCIES**

International Organisations: United Nations Environment Programme (UNEP), International Union for Conservation of Nature and Natural Resources (IUCN), International Panel on Climate Change (IPCC), International Panel on Oceans (IPO), EarthSummit, Convention on Biological Diversity (CBD), World Wide Fund for Nature (WWF), Man and Biosphere Programme (MAB), India: Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Earth Sciences (MoES), NGO's.

### **UNIT- X: GLOBAL CLIMATE CHANGE**

Introduction to climate change, past climatic fluctuations. Current climate and weather – Wind, monsoon, cyclones. Global ocean circulation. Global warming and greenhouses gases – Carbon dioxide, methane, nitrous oxide, ozone. Sources of green house gases – Fossil fuel use, vehicle emissions, industry; agricultural practices, deforestation. Role of UNFCCC (United Nation Framework Convention on Climate Change) in monitoring green house gas emissions. International treaties: Kyoto protocol, Paris agreement. Acid rain, source, impacts and management. Ozone layer depletion: causes, impacts and remediation.

**VETERINARY SCIENCE**  
**(DEGREE STANDARD)**

**Subject Code: 296**

**UNIT – I: GENERAL**

Role of livestock and their products in Indian economy and human health, current livestock programmes and policies of State and Nation – Economics of dairy, sheep, goat, poultry, pig and rabbit farming; constraints to the livestock development programs, common offences against animals – SPCA, Animal Welfare Board of India, NGOs.

**UNIT – II: LIVESTOCK MANAGEMENT**

Common terms used in Animal Husbandry – Identification of age of animals – Livestock and poultry breeds and breed characters; housing systems, and requirements of space, ventilation, water, sanitation and waste disposal. Management of milk, meat, egg and wool producing livestock, breeding bulls and draft animals and wild animals in captivity, farm records and their maintenance, systems and strategies for livestock improvement for enhancing productivity.

**UNIT – III: LIVESTOCK NUTRITION**

Nutritional terms and definitions – Role of nutrition in health and production; classification and composition of feed and fodders including forest grasses; anti-nutritional factors and toxins in feeds and fodders; feeding standards and nutrient requirements of different categories of livestock / poultry and computation of rations.

Nutritional deficiency and its influence on livestock performance; feed supplements and additives; conservation and preservation of feed and fodders; economic utilization of agro by-products for feeding livestock – Utilisation of unconventional feeds – Wildlife nutrition.

Quality control of feed, feed block/baling, By-Pass Proteins and by-pass Fat, Feeding livestock during scarcity, Metabolic disorders in Livestock and Poultry, Processing of feeds and forage to improve nutritive value.

**UNIT – IV: LIVESTOCK BREEDING AND GENETICS**

Important breeds of cattle, buffalo, sheep, goat, pig and poultry with special reference to economic characters – Important species of wild animals and their breeding in captivity. Selection of Livestock for production, reproduction and disease resistance traits. Principles of genetics and basis of population genetics, genetic parameters. Nature of DNA and RNA-their models and functions; applications of recombinant DNA technology, cloning and marker Assisted selection and Cytogenetics. Animal breeding policies and programmes in state and Nation.

**UNIT – V: VETERINARY ANATOMY, PHYSIOLOGY AND BIOCHEMISTRY**

Gross study of bones, joints and muscles of skeleton Gross study of heart and its conduction system. Gross study of organs of digestive, respiratory urinary and reproductive systems. Digestion, metabolism and absorption of carbohydrates, proteins and fats in simple stomach animals and ruminants – mechanism of respiration. General functions of blood (blood cells, plasma & serum)

coagulation, cardiac cycle, Blood circulation, Blood pressure, renal function  
Hormonal control of Lactogenesis. Environmental factors affecting animal  
production – Environmental stress on animal performance – Green Houses  
Gases – Role of ruminants.

### **UNIT – VI: VETERINARY MICROBIOLOGY, VETERINARY PREVENTIVE MEDICINE**

Bacteriology & Mycology: Classification - isolation, identification and culturing of  
bacteria and fungi -Methods of transmission of infection - Sterilization and  
disinfection - Antibigram. Virology: Classification, - cultivation, replication General  
characteristics of various families of RNA and DNA viruses. Immune system organs,  
tissues and cells; infection and immunity; type and grade of immunity, serological  
reactions and modern diagnostic techniques – vaccine.

Epidemiology - Concept, Scope, Objectives and Uses. Monitoring and surveillance-  
epidemiological disciplines. Pathogenesis, clinical signs, differential diagnosis,  
prevention and control of common bacterial, viral, fungal, rickettsial and parasitic  
diseases of livestock, poultry and pet animals including wild life species- Regional,  
endemic, emerging and re-emerging important disease. Allergic skin tests and  
modern diagnostic techniques.

### **UNIT – VII: PATHOLOGY AND PARASITOLOGY**

Concept and causes of diseases in animals; general principles and procedures of  
necropsy; collection, preservation and dispatch of morbid materials for laboratory  
diagnosis, disease investigation; common pathological conditions seen in domestic,  
wild, zoo and laboratory animals and birds. Vetro-legal implications.

Classification of Parasites – Parasite and parasitism in animals; important  
morphological features, life-cycles, mode of transmission, pathogenesis, diagnosis,  
chemotherapy and general control measures of parasites associated with disease in  
animals, birds and zoo animals.

### **UNIT - VIII: PHARMACOLOGY**

Drug action – Pharmacokinetics (absorption, distribution, biotransformation and  
excretion), Pharmacodynamics – local and general anesthetics. Antibiotics and  
chemotherapy – Toxicology - Ethnoveterinary practices.

### **UNIT - IX: VETERINARY CLINICAL MEDICINE, VETERINARY GYNAECOLOGY AND OBSTETRICS AND VETERINARY SURGERY AND RADIOLOGY**

General and special clinical examination, etiology, clinical signs, pathogenesis,  
diagnosis, prevention and control of metabolic, deficiency diseases. Ethics and  
jurisprudence in domestic and wild animals.

Reproductive physiology; hormones and reproduction; Accidents of gestation,  
livestock fertility and infertility; artificial insemination; semen characteristics of  
different species of livestock and cryopreservation. Multiple ovulation and embryo  
transfer technology in livestock and zoo animals Reproductive disorders and their  
management.

General surgical principles – Pre and post-operative considerations, anesthesia,  
asepsis and anti-sepsis and sterilization; scope, history and development of

veterinary radiology; Imaging pathology of different parts of body-surgical emergencies – Intensive care – Physiotherapy – Diathermy.

### **UNIT- X: LIVESTOCK PRODUCTS TECHNOLOGY**

Ante mortem and Post mortem inspection – Objectives of meat inspection – Abattoir practices, methods of slaughtering and dressing; Meat Inspection Laws, utilization of by products; unsound meat and its disposal; quality control of meat and eggs and their products. Milk: Proximate Composition, milk collection, cooling / chilling and transportation; physio-chemical and nutritional characters of milk and milk products; processing of raw milk and production of market milk. Condensed and dried milk, special milk and Indian Dairy Products - Packaging and storage.

Cleaning and sanitization of dairy equipments and plants; role of micro-organisms in milk and milk products; legal standards and quality assessment of milk and milk products-role of milk and milk products, meat and egg in human nutrition – Detection of adulterants in milk. Good Manufacturing Practices (GMP) in dairy and Hazard analysis in critical control point (HACCP) in dairy Processing. FSSAI laws.

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**ANNEXURE - III**

CERTIFICATE OF PHYSICAL FITNESS BY	A SINGLE MEDICAL OFFICER
	THE CIVIL MEDICAL BOARD

Signature of Candidate\_\_\_\_\_

I/We do hereby certify that I/We have examined (full name)Thiru / Thirumathi / Selvan / Selvi \_\_\_\_\_ a Candidate \_\_\_\_\_ for employment under the Government as \_\_\_\_\_ in the \_\_\_\_\_ Office in the \_\_\_\_\_ Department and whose signature is given above and cannot discover that he/she has any disease, communicable or otherwise, constitutional affliction or bodily infirmity/except that his/her weight is in excess of/below the standard prescribed, or except

I/We do not consider this a disqualification of the employment he/she seeks. His/Her age is according to his / her own statement\_\_\_\_\_years and by appearance about / \_\_\_\_\_years.

I/We also certify that he/she has marks of Small Pox/ Vaccination.

Chest measurement in Inches  $\frac{\text{On full Inspiration}}{\text{On full expiration}}$   
Difference expansion

Height in ft.

Weight in

kg.

Cardio-Vascular

System Respiratory

System His/Her vision

is normal

Hypermetropic/ Myopic/ Astigmatic/

[Here enter the degree of defect and the strength of correction glasses]

Hearing is normal / defective (much or slight)

Urine-Does chemical examination show

(i) Albumen (ii) Sugar State specific gravity:

Personal marks (at least two should be mentioned) For Identification

1.

2.

SIGNATURE:

RANK:

DESIGNATION:

PRESIDENT:

Member (I)

(II)

STATION:

DATE:

STATION:

DATE:

The candidate must make the statement required below prior to his / her Medical Examination and must sign the declaration appended thereto. His attention is specially directed to the warning contained in the note below:-

1. State your name in full:
2. State your age and birth place:
3. (a) Have you ever had small pox, intermittent or any other fever, enlargement or suppuration of glands spitting of blood, asthma, inflammation of lungs, heart disease, fainting attacks, rheumatism, appendicitis?  
OR  
(b) any other disease or accident requiring confinement to bed and medical or surgical treatment?
4. When, where your last vaccinated
5. Have you or any of your near relations been afflicted with consumption, serofula gout, asthma, fits, epilepsy or insanity?
6. Have you suffered from any form of nervousness due to over work or any other cause?
7. Furnish the following particulars concerning your family:

Father's age, if living and state of health	Father's age at death and cause of death	No. of brothers living, their ages, state of health	No. of brothers dead, their ages at and cause of death
(1)	(2)	(3)	(4)

Mother's age, if living and state of health	Mother's age at death and cause of death	No. of Sisters living, their ages and state of health	No. of Sisters dead, their ages at and cause of death
(1)	(2)	(3)	(4)

I declare all the above answers to be to the best of my belief, true and correct.

CANDIDATE'S SIGNATURE

Note: The candidate will be held responsible for the accuracy of the above statement by willfully suppressing any information he will incur the risk of losing the appointment and if appointed, of forfeiting all claim to superannuation allowance or gratuity.

**ANNEXURE -IV****APPENDIX-I to the G.O. (Ms) No.08, Welfare of the Differently Abled Persons  
(DAP-3.2) Department dated 21.09.2021****Certificate regarding physical limitation in an examinee to write**

This is certify that I have examined Mr/Ms/Mrs. \_\_\_\_\_  
 \_\_\_\_\_ (Name of the candidate with disability) a  
 person with \_\_\_\_\_ (Nature and percentage of disability  
 as mentioned in the certificate of disability), S/o/D/o  
 \_\_\_\_\_ a resident of  
 \_\_\_\_\_ (Village / District / State and to state that He / She has  
 physical limitation which hampers his / her writing capabilities owing to his / her  
 disability.

**Due to the above mentioned disability following concession may be given:-**

1. Exemption from Tamil / Second Language.
2. Extra \_\_\_\_\_ hours for writing theory exam.
3. Allocation of a scribe.
4. Overlooking spelling mistakes and grammatical errors.
5. Using calculator / assistive devices
6. \_\_\_\_\_ (Any other assistive devices or  
 concessions).

\*strike out the non applicable.

Signature

(Name of Government Hospital / Civil Surgeon / Medical Superintendent / Signature of  
 the notified Medical Authority of a Government Health Care Institution)

Name & Designation

Name of Government Hospital / Health Care Centre / The notified Medical Authority

Place:

Date:

Signature / Thumb impression  
 of the Differently Abled Person

(Photo of the  
 Differently  
 Abled Person  
 and Stamp to  
 be fixed here)

Note:

Certificat4 should be given by a specialist of the relevant stream / disability  
 (e.g. Visual Impairment – Ophthalmologist, Locomotor disability – Orthopedic  
 Specialist / PMR etc.,)

**ANNEXURE – V****Tentative Timeline for the Recruitment Process**

<b>Sl. No.</b>	<b>Process</b>	<b>Timeline</b>	
1.	Last date for submission of online application	12.01.2023	
2.	Application Correction Window period	From 17.01.2023 12.01 A.M.	To 19.01.2023 11.59 P.M.
3.	Publication of Preliminary Examination Results	June-2023	
4.	Main Written Examination	September-2023	
5.	Publication of Main Written Examination Results	November-2023	
6.	Oral Test	December-2023	
7.	Final Selection List		

**Secretary**