TNPSC FOREST APPRENTICE
NOTIFICATION|SYLLABUS

TNPSC announced Forest Apprentice Exam Selection for the following posts is made in three successive stages Selection will be made in three successive stages i.e., (i) Written Examination (ii) Physical Test (Walking Test) and (iii) Oral Test. Final selection will be made on the basis of the total marks obtained by the applicants at the Written Examination and Oral Test

Only if sufficient applicants with Forestry subject are not available for selection against any vacancy/ vacancies, the applicants with other Degree qualification can be considered for selection process towards those remaining vacancies.

Application opening date: 4.07.2018

Application Closing Date: 01.08.2018

Exam date:

Date and Time of Written Examination	
Paper – I (Optional Subject - I) Paper – II (Optional Subject - II) Paper – III (General Studies)	23.09.2018 to 30.09.2018 F.N & A.N

Educational Qualification: Any Degree

Degree 1	Degree 2
Must possess a Bachelor's degree in Forestry or its equivalent degree of any Institution or University recognized by UGC	Must possess a Bachelor's Degree or its equivalent degree in any one of the following subjects from any Institution or University recognized by UGC 1. Agriculture 2. Animal Husbandry and Veterinary Science 3. Botany 4. Chemistry 5. Computer Applications / Computer Science 6. Engineering (All Engineering subjects including Agricultural

	Engineering) 7. Environmental Science 8. Geology 9. Horticulture 10. Marine Biology 11. Mathematics 12. Physics 13. Statistics 14. Wildlife biology 15. Zoology

Note: Only if suitable candidates with the educational qualification referred to in item (a) in column (2) are not available for selection, candidates with qualification referred to in item (b) will be considered for selection process in the respective communal categories.

(C) PHYSICAL QUALIFICATION

Category	Height (not less than)	Chest Measurement not less than (round the chest)		
		on full expiration	on full inspiration	Difference
Men	163 cms	84 cms	89 cms	5 cms
Women	150 cms	79 cms	84 cms	5 cms

Scheme of Examination mains written examination

Stage - I Objective type

Paper-I: Optional Subject – 1 (Degree Std.)	(200 Questions)
Paper-II: Optional Subject – 1 (Degree Std.)	(200 Questions)
General Studies (Degree Std.) (150 Questions) Aptitude and Mental Ability Test (S.S.L.C. Std.) (50 Questions)	GS 150 questions 50 Apps Question

Optional Details

Group I	1. Agriculture (Code No.284) 2. Horticulture (CodeNo.278) 3. Animal Husbandry and Veterinary Science (Code No. 296)
Group II	Computer Applications (Code No.288) ,Computer Science (Code No.286)
	Mathematics (CodeNo.276),Statistics

Other Subjects	Botany (Code No.268),Chemistry (Code No.243) ,Engineering (All Engineering subjects including Agricultural Engineering) (Code No. 230) ,Environmental Science (Code No.298) ,Forestry (Code No.283) ,Geology (Code No.239) ,Marine Biology (Code No.293) , Physics (Code No.241) , Wildlife biology (Code No.291) , Zoology (Code No.270)
Compulsory Subject Paper-III	(Degree Std.) (150 Questions) Aptitude and Mental Ability Test (S.S.L.C. Std.) (50 Questions)

Note: No applicant shall be allowed to take more than one subject in the same group (i) Agriculture, Horticulture, Animal Husbandry and Veterinary Science (ii) Mathematics and Statistics (iii) Computer Applications and Computer Science. However, one may choose two subjects in the other subject's category.

Stage –II physical Test

Stage –III –Interview 120 marks

Vacancy details

Name of the Post	Number of Vacancies
Forest Apprentice (Regular)	148
Forest Apprentice (SC Backlog)	10

Age

S.NO	Reservation category	Minimum Age	Maximum
1	SC/ST	18	35
2	BC/MBC/DNC/BCM	18	35
3	OTHER CATAGORIES	18	30
4	For Ex-Servicemen (Irrespective of caste)	18	37

EXAMINATION FEE CONCESSION:

Category	Concession	Condition
SC/ST/SCA	Free	--------
BC/MBC/DNC/BCM	Three time free	For Graduates only
Ex- Service man	Two times	For prescribed qualification

Differently able/ Destitute widow	Free	---------------

Note: if you claimed earlier free concession don't use it again so apply carefully while applying.

Note:

1. Make sure while applying the correct serial number of Community certificate, SSLC Mark sheet, and date of Birth. These details can't be edited once you updated.
2. For Fees Concession make sure if you claimed earlier three times don't use again. If you claimed wrongly your selection will be rejected during certificate verification.
3. If you wrote 10th As a private candidate enter your last mark sheet number
4. You can edit your application upto the last date of application but Centre and Subject and other details can be edited, Date of Birth, Community Certificate, 10th Mark sheet Numbers can't be edited once you submitted.
5. "Destitute Widow" shall mean a widow whose total monthly income from all sources shall not be more than Rs.4, 000/-(Rupees Four Thousand only). . Such applicants should produce a certificate from the R.D.O or the Assistant Collector or the Sub-Collector
6. If you are going to Apply through Computer Center apply carefully especially fees concession / certificate number
7. PSTM should be obtained before the announcement date.

TNPSC GROUP I & II PRELIMS & MAINS ADMISSION OPEN
1. **TEST BATCH / ONLINE POSTAL**
2. **CLASSES / CLASSROOM COACHING / ONLINE COACHING**
TO JOIN CONTACT 9952521550

To get Daily Current Affairs Whatsapp with your name and District to 7418521550

For Group I & II Mains Answer writing practice send your details with languages to 044-48601550 via whatsapp.

ANNEXURE - II
TAMIL NADU PUBLIC SERVICE COMMISSION
GROUP – VI SERVICES
OPTIONAL PAPERS - I & II (DEGREE STANDARD) OBJECTIVE TYPE

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 AYOG – 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 aplications

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, silkwork 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 propogated 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 (FYPs) - 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
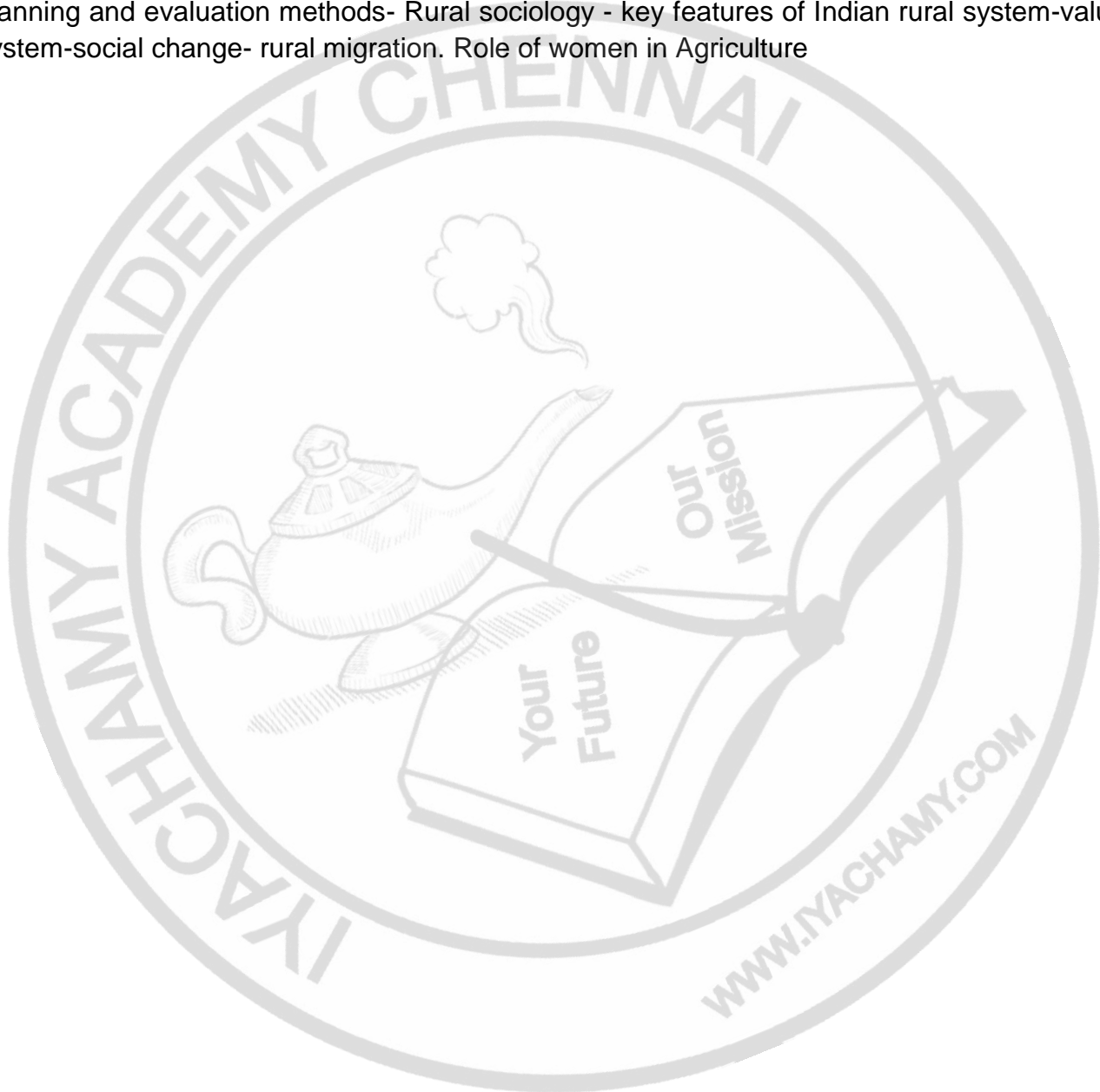
ANIMAL HUSBANDRY AND VETERINARY SCIENCE
(DEGREE STANDARD)
SUBJECT CODE 296

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 - Antibiogram. 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.

BOTANY
(DEGREE STANDARD)

SUBJECT CODE 268

UNIT – I PHYCOLOGY, MYCOLOGY & LICHENOLOGY

Phycology - Fritsch's classification of Algae - pigmentation - Thallus organization - Life cycles- patterns of Algae - Evolutionary trends in the Sexulity of Algae - Economic importance - Algae as food, fodder, fertilizer and medicines - phytoplanktons and their role.

Mycology - Classification of fungi (Alexopoulos and Mims 1979) - structure, reproduction and economic importance of Phycomycetes, Ascomyates, Basidiomycetes and Deuteromyates.

Lichenology - structure, reproduction and economic importance of lichens.

UNIT- II BRYOLOGY AND PTERIDOLOGY

Byrophytes - General characteristics, structure; reproduction and alternation of generations. Pteridophytes - General characteristics - Psilopsida, Lycopsida, Sphenopsida and Pteropsida - Stelar organisation - origin of heterospory and seed habit.

UNIT –III GYMNOSPERMS AND PALEOBOTANY

A comparative account of vegetative and reproductive structure of Cycadales, Coniferales and Gnetales - Structure of wood in Gymnosperm - Economic importance of Gymnosperms – Paleobotany, Geological Time Scale - Fossilization methods - Fossil types.

UNIT- IV ANGIOSPERM MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY

Root and Stem modification in relation to habitat. Infloresence: Raceme, Cyme and Special types   Pollination – Types, Agents (Biotic and Abiotic) and contrivances promoting cross pollination. Taxonomy - Angiosperm Classification - Bentham and Hooker's system - International code of Botanical Nomenclature (outline).

Characteristics features and Economic importance of the following families:-
1) Magnoliaceae
2) Rutaceae
3) Anacardiaceae
4) Leguminosae
5) Asteraceae
6) Apiaceae
7) Euphorbiaceae
8) Arecaceae
9) Poaceae
Economic Botany of Plants yielding wood timber, fibre, oil and medicines.

UNIT- V   ANATOMY AND EMBRYOLOGY

Anatomy - Meristems and types. Permanent tissues, Simple and Complex tissues - Normal and Abnormal secondary thickening.

Embryology - Microsporogenesis, Megasporogenesis - types of embryo sacs (Mono-bi-and tetrasporic). Double fertilization and Triple fusion, Types of Endosperm - Embryo development in Dicots and Monocots. Apomixis and Polyembryony Culture techniques - anther and embryo.

UNIT –VI   GENERAL MICROBIOLOGY AND PLANT PATHOLOGY

Morphology, reproduction and economic importance of Bacteria. Viruses - Bacteriophages, Cyanophages, Mycophages, their general structures and multiplication. Mycoplasma - Structure. Fermentation and Antibiotic production.

Plant Pathology - Name of the causative organism, etiology and control measures of the following plant diseases.

1) Blast of Paddy
2) Wilt of Cotton
3) Citrus Canker
4) Powdery Mildew
5) Red rot of Sugarcane
6) Little leaf of Brinjal
7) Bunch Top of Banana
8) Early and late Blights of Potato
9) Rust and Smut diseases.

UNIT – VII   PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS

Physiology - Water relations of plants - absorption and translocation of water and minerals - mineral nutrition - Photosynthesis, Photochemical reactions and carbon fixation pathways – Respiratory metabolism: aerobic and anaerobic respiration. Enzymes: Role as biocatalysts - Nitrogen Metabolism: Nitrogen cycle - Nitrogen fixation - Nitrate reduction. Plant growth substances chemical nature and physiological functions of auxins, gibberellins, cytokinins, ethylene, abscissic acid and Brassinosteroids.

Biochemistry and Biophysics

Biopolymers - A brief account of Carbohydrates, Lipids,Proteins and Nucleic acids and their monomers. An elementary account of thermodynamics - definition of energy - structure and role of ATP.

UNIT – VIII   CYTOLOGY, GENETICS AND EVOLUTION

Cytology - Organization of Prokaryotic and Eukaryotic cells. Cell organelles - structure and function. Chromosomes: morphology structure and their role. Cell division: Mitosis and Meiosis.

Genetics - Medelism - Interaction factors - linkage and crossing over, multiple, alleles, mutation, structure, replication and role of nucleic acids.

Evolution- Origin of life: Theories of evolution Darwin, Lamarck and De Vries.

UNIT –IX ECOLOGY, ENVIRONMENT AND CONSERVATION BIOLOGY

Ecology: Ecosystem concept - Plant communities: Hydrophytes, Xerophytes, Mangroves. Plant sucession primary and secondary - Climax formation.

Environment: water, air and land, Garbage disposal, Environmental Protection Agencies, Pollution monitoring and control.

Ecosystem: Components and functions – Global warming, Green house effect, Ozone Layer Depletion

Conservation Biology: Conservation and sustainable development/ Productivity of Soil, forests and natural resources.

UNIT-X HORTICULTURE AND PLANT BREEDING

Horticulture: Importance and scope of Horticulture, Classification of Horticultural Plants - Fruits, Vegetables and Ornamentals.

Garden design and types:- Rockery, Bonsai, Kitchen garden, Lawn making, Floriculture. Cultivation of Commercial Flowers – Jasmine; plant propagation methods - cutting, grafting, layering (Rose) budding, stock - scion relations in Mango,

Plant Breeding: Hybridization techniques Plant breeding methods employed in the following crops:-

1) Cotton
2) Sugarcane
3) Paddy

CHEMISTRY
(DEGREE STANDARD)

SUBJECT CODE .243

UNIT - I PHYSICAL CHEMISTRY

a) Gas law and Kinetic Theory:- Ideal gas equation - Deviation from ideal behaviour - vander waals equation for real gases - Molecular velocities - the Maxwell's distribution of molecular velocities –heat capacity and viscosity of gases.

b) Solid State:- Crystal systems - Bravaislattice - Unit Cell - Miller Indices - Symmetry elements in crystals - Bragg's equation - Radius ratio's and packing in crystals – Determination of crystal structures by Braggs method – structure of Nacl, Kcl, Zns and spinals.

c) Thermodynamics:- Intensive and extensive variables - First law of thermodynamics –
CP and CV relation - Hess's law of constant heat summation - Kirchoff's equation - Second law of thermodynamics - Carnot theorem - entropy and probability, Joule Thomson effect - Free energy and Chemical equilibrium - Temperature and pressure dependence and - Gibb's and Helmholtz functions – Heterogeneous equilibrium and Le – Chatlier principle.

UNIT - II

d) Chemical Kinetics:- Rate laws - rate constant - order and molecularity of reactions I, II, III, and Zero order reaction Arrhenius theory - collision theory and Transition state theory - catalysis.

e) Electro-Chemistry:- Types of reversible electrodes - Nernst equation - reference electrode and standard hydrogen electrode - computation of cell e.m.f. calculations of thermodynamic quantities of cell reactions (DG, DH, DS and K) - Over potential and hydrogen over voltage - Arrhenius theory - Debye 'Huckel equation - Kohliraush's law - Ostwald's dilution law - Determination of PH and Pka of acids by potentiometric methods.

UNIT - III

f) Chemical spectroscopy:- Elementary ideas of microwave, infrared, Raman, uv, NMR, ESR and Mass spectroscopy.

g) Pharmaceutical chemistry: Terminology pharmacology, pharmacotheraies, toxicology, chemotherapy, classification, and nomenclature of drugs, sources of drugs, assay of drugs by biological, chemical and immunological methods, physiological effects of functional groups of drugs different types of drugs like analgesics, antibiotics, antiseptics, disinfectants, anesthetics, antidepressants, antipsychotic etc.

UNIT - IV

h) Colloids and surface Chemistry:- Classification – preparation, purification - properties - Tyndall effect- Gels - Emulsions Absorption - Langmuir isotherms - Heterogeneous catalysis.

i) Physical properties and Chemical constitution:- Surface tension - parachor and its application

to structural problems – Dipole moment - applications of dipolemoment measurements to structural studies of simple inorganic and organic molecules - magnetic properties of matter, diamagnetism, paramagnetism, ferromagnetism and anti-ferromagnetism - Applications to structural problems.

UNIT- V INORGANIC CHEMISTRY

j) Periodic classification:- Classification based on electronic configuration - periodic properties - atomic and ionic radii, ionisation potential, electron affinity and electronegativity- various scales - trend along periods and groups.

k) Chemical bond:- Lattice energy - VSEPR Theory and its applications - partial ionic character from electronegativity - Fajan's Rules.

l) Compounds of Boron:- Electron deficient nature of boron compounds - preparation and properties of halides and nitrates of boron - diborane – Borazine, silicones and structures of silicates

UNIT - VI

l) Lanthenides and Actinides- Ocurrence Electronic configuration oxidation state, magnetic properties and complexation behaviour - comparison of lanthanides and actinides, lanthanide contraction and their position in the periodic table.

m)Fertilisers:- Ammonium nitrate, ammonium phosphate, Superphosphate and Diammonium Phosphate, NPK fertilisers.

n)Nuclear Chemistry:- Radio activity – detection and measurement – half life period - Nuclear stability, - n/p ratio - isotopes, isobars and isotones Nuclear reactions Spallation - Nuclear fission and fusion – stellar energy uses of nuclear energy - nuclear power projects in India - applications of tracers in industry, medicine, agriculture.

UNIT - VII

o) Co-ordination Chemistry:- Redo Nomenclature - theories of co-ordination compounds - Werner, valence bond, crystal field and ligand field theories - Effective atomic number - isomerism - Metal Carbonyls of iron and Nickel.

p) Analytical Chemistry:- i) Principles of volumetric analysis - different types of titrations gravimetric analysis - separation and purification techniques.

UNIT - VIII ORGANIC CHEMISTRY

q) Types of reactions:- Nucleophilic, electrophilic, free radicals, addition and elimination reactions.

r) Electron displacement effects:- Inductive, inductometric, electromeric, mesomeric, resonance, hyperconjugation and steric effects.

UNIT - IX

s) Nature of Bonding:- Hybridisation (Sp, Sp2 & Sp3) and Geometry of molecule - cleavage of bonds - homolytic and heterolytic fission of carbon – carbon bonds - Reaction intermediates - free radicals, carbocations and carbonions - their stability.

t) Stereo Chemistry:- Optical isomerism and Geometrical isomerism - chirality - optical isomerism of lactic and tartaric acid - Racemisation - Resolution - Asymmetric synthesis - walden inversion - cis and trans isomerism of maleic and fumeric acids - R-S-Notations - conformational analysis of cyclohexane - applications of ORD and CD Techniques.

UNIT - X

u) Dyes:- Classification and Properties of dyes – methyl orange, cangored, malachite green, fluorenscein and indigo.

v) Carbon hydrates:- Classification and reactions - Glucose, Fructose, Sucrose and lactose - structure of glucose and fructose.

w) Aromatic Substitution:- Mechanism of nitration, Halogenation, sulphoration and Friedel Crafts reaction - Orientation effects - nucleophilic substitution - Benzyne mechanism.
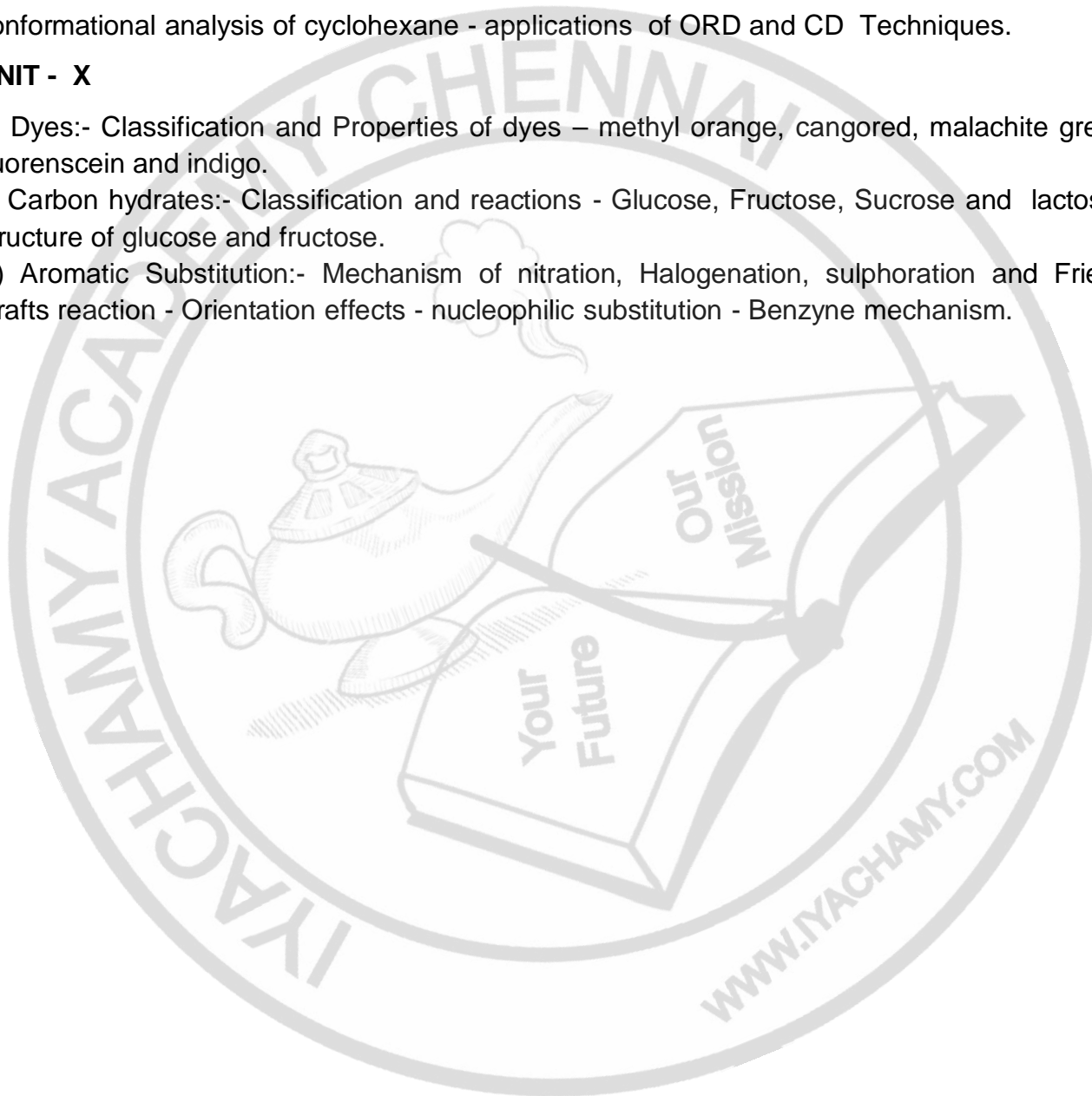
COMPUTER APPLICATIONS
(DEGREE STANDARD)

SUBJECT CODE 288

UNIT – I BASIC MATHEMATICS

Prepositional 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/subtracter - 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 – VII 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

Prepositional logic sets, relations, functions, partial orders and lattices, regular and context free 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 inheritence, 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.

ENGINEERING
(DEGREE STANDARD)

SUBJECT CODE   230

UNIT- I   MATHEMATICS

Matrices: Eigenvalues   - Eigenvectors – Cayley–Hamilton theorem –Similar and Orthogonal transformations – Reduction of a quadratic form to Canonical form by orthogonal transformation.

Ordinary differential equations: Order and degree – Types of Equations –Higher order linear ODE with constant coefficients - Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficient.

Functions of several variables : Partial derivatives – Total derivatives – Euler's   theorem – Implicit functions–Jacobians– Taylor's theorem – Maxima and Minima.

Integration: Techniques of integration using integration by parts and Bernoulli's   formula – Line, Surface and Volume Integrals – Change of order of integration.

Vector Calculus: Vectors and scalars – Directional derivatives – Gradient, Divergence and Curl of vectors – Applications of Green's theorem, Gauss divergence theorem and Stoke's theorem.

Complex variables: Verification of Analyticity – Construction of Analytic functions – Conformal Mappings – Bilinear transformations.

Complex Integration: Cauchy's integral theorem – Cauchy's fundamental theorem – Cauchy's residue theorem – Taylor's theorem – Laurent's series–Contour integration (excluding poles on the real axis)

Laplace transform: Existence of Laplace transform – Laplace transform of elementary functions– Properties – Laplace transform of Periodic functions – Inverse Laplace transform – Convolution theorem – Solution of linear second order ODE by Laplace transform technique.

UNIT - II   ENGINEERING PHYSICS

Newton's laws of motion – gravitation – work, energy and power - elasticity – moduli of elasticity and their determination-sound intensity level – reverberation – ultrasonics: production and detection - thermal conductivity and expansion - flow of heat-thermodynamics - heat engines – optical interference, anti-reflection coatings - diffraction and polarization – lasers and types - optical fibres and applications - photoelectric effect - atom models - dual nature of matter and radiation - nuclear   models - radioactivity - nuclear fission and fusion - crystal structures - unit cells - packing factor – imperfections – superconductivity - magnetic and dielectric materials – semiconducting materials - nano materials.

UNIT- III ENGINEERING CHEMISTRY

Fuel –Classification of fuels - Calorific value – Solid fuel – Liquid fuel – Gaseous fuel – Octane number – Cetane Number – Fuel Cells. Lubricants – Classification – Greases – Solid Lubricants. Water – Sources – Classifications – Softening process – Desalination – RO Method – Internal treatment – Treatment of Water for Municipal purposes. Plastics – High polymer – classification – Polymerization techniques – Thermoplastics – Thermosetting resins – examples. Rubber – Types of Rubber – Vulcanisation – Properties – Unvulcanised and Vulcanised.   Natural Rubber – Synthetic Rubber – examples. Refractories – Classification – Manufacture of Refractories – Magnesite – Silica – Zirconia – Chromite. Abrasives – Natural – Artificial–Abrasive paper & cloth. Corrosion: Dry and Wet corrosion – Factors affecting corrosion- Different types of corrosion. Productive coating – Hot dipping- metal cladding, electrodeposition – Organic Coatings – Paints – Varnishes. Cement and lime- setting and hardening. Explosives- classifications- characteristics- requirements for good explosives- nitrocellulose- TNT- TNB-DNB-PETN-RDX. Alloys- purpose of making alloy- types of alloys- Ferrous alloys. Electrochemistry – conductors and non conductors – Kohlrausch law – Electrochemical cell-reversible and irreversible cells – EMF- Concentration cell- polarization – over voltage, decomposition potential.

UNIT – IV ENGLISH

Grammar: Articles – Prepositions – Tenses (simple present, present continuous, simple past, past continuous, future, & perfect tenses) – Modal verbs – Clauses – Conditional clauses – Subject-Verb agreement – conjunctions – Active & passive voice – Reported speech   (Direct to Indirect speech) – Error correction – Combining sentences using connectives – Cause & effect expressions (because, so, due to, on account of, etc.) – Framing questions (converting statements into questions)

Vocabulary: Synonyms & antonyms – Prefixes, suffixes & intensifying prefixes (e.g. Flammable – inflammable) – Phrasal verbs – Idioms – Fixed expressions (e.g. adhere to, lodge a complaint to, etc.) – One word substitution – Collocation – Expansion of compound nouns (e.g. keyboard)

Reading: Reading comprehension passage – Data interpretation (e.g. comprehension questions based on table /chart) – Choosing appropriate title for a given short passage – Inferential questions based on a short reading passage – Reading comprehension questions making use of scanning & skimming strategies – Jumbled Sentences.

Writing: Definitions (instrument & technical terms) – Visual interpretation (picture/photo/chart etc.) – process description – Letter writing (formal / official) – email communication (email etiquette) – essays.

UNIT – V BASICS OF COMPUTER ENGINEERING

Computer Organization - CPU and Microprocessor [ALU, Control Unit and Bus Structure] – Data Storage [Primary, Secondary and Virtual] – Input and Output Devices
Systems Software – Assembler – Compiler – Loader – Linker – Operating Systems
Programming Languages – Classification of Programming Language, High-Level Languages
Basic Computer Networking – Network Components [Routers, Bridges, Gateways] – ISO-OSI Reference Model – LAN – WAN – Client-Server Architecture – Internet
Applications – Office Tools – Word-processor – Spreadsheet – Powerpoint – Database– E-mail – Browser
IT Enabled Services – E-Government – E-Commerce – Multimedia

UNIT - VI BASICS OF CIVIL AND MECHANICAL ENGINEERING

Introduction to Engineering mechanics – Units and Dimensions – Laws of Mechanics – Coplanar Forces – Static Equilibrium of Rigid body – Moment of a force – free body diagram – friction – laws of friction – sliding friction – wedge friction – Rolling resistance– Lader friction - Friction in screws – Screw jack – Belt friction – Properties of surfaces and solids – Centroids and centre of mass – line and areas – Rectangular, circular, triangular areas by integration – T-section, I- Section, Angle section, Hollow section – Area moment of inertia of plane areas – Parallel axis theorem – Centroid of the simple solids – Dynamics of particle – Displacement, velocity and acceleration – Different types of motion – Rectilinear , Curvilinear and Projectile motions – Newton's II-law of motion – Work Energy equation – Impulse and momentum principles.

UNIT - VII BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Ohm's law- Kirchoff's laws - Introduction to DC and AC circuits –Power and powerfactor-single phase and three phase circuits
Operating principles of moving coil and moving iron instruments (voltmeters and ammeters)- wattmeters and energy meters
Construction and principle of operation: DC motors- DC generators-Transformers-Induction motors
Characteristics of PN junction diode-zener diode- half wave and full wave rectifiers-Bipolar junction transistor (CC,CE,CB configurations)-Amplifiers-Operational amplifiers
Binary number system- logic gates- Boolean algebra – Half and full adders- Flip-flops – registers and counters- A/D and D/A conversion
Types of analog and digital signals- Modulation and Demodulation(amplitude and frequency)
Communication systems: Radio- TV- Fax- Microwave-Satellite and optical fibre

UNIT - VIII   PRINCIPLES OF MANAGEMENT

Management- Definition, Evolution- Taylor, Fayol, Elton Mayo, Peter Drucker
Planning- Types, Steps, Forecasting, MBO, MBE
Organising- Deparmentation- Line and staff, Delegation and Decentralization
Staffing- Manpower planning, Recruitment and selection, Training, Performance Appraisal
Directing- Leadership styles, Discipline, Communication in business
Controlling- Types, Control Techniques, Budgetary Control, Statistical Control

UNIT - IX   TOTAL QUALITY MANAGEMENT

Quality - vision, mission and policy statement, dimensions of product and service quality, contributions of quality gurus-Deming, Juran, Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Cost of Quality, continuous process improvement- PDCA, Quality Circle, 5S, Kaizen, Statistical Process Control (SPC), 7 QC Tools, new management tools, benchmarking, 6 sigma, Process Quality, Quality Function Deployment(QFD), POKA YOKE, Total Productive Maintenance (TPM), Business Process Reengineering(BPR), ISO 9004: 2000 - QMS, ISO-14000.

UNIT - X   ENVIRONMENTAL SCIENCE AND ENGINEERING

Environment– Global perspective- awareness of environmental pollution- Classification of Pollutants- Air Pollution- Composition of Air – Major sources of air pollution. Gaseous Pollutants- effect of air pollution on weather, climate, atmospheric process, NOX, SO_2, CO, CO_2, Fly ash, Vehicular pollution- automobile emission- prevention- green houseeffect – chlorofluoro carbon- ozone layer -ozone depletion- smog- photochemical smog, acid rain. Water pollution- types of water pollution- Factors affecting surface water – sewage and domestic waste – BOD, COD. Industrial effluent- harmful effects of industrial pollutants- agricultural discharge – detergent and toxic metal – siltation. Thermal pollutants- effect of thermal pollution- radioactive pollutant – inorganic pollutants and its detrimental effects. Soil Pollution- sources of soil pollution- effect of carbon waste- noise pollution- sources of noises of pollution- types of noise pollution-prevention and control.

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), Earth Summit, 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 UNFCC (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.

FORESTRY
(DEGREE STANDARD)

SUBJECT CODE   283

UNIT- I SILVICULTURE

Forests - definition. Extent of forests in India and other countries. Forest types of India and Tamil Nadu - revised classification - pure and mixed stands - even and_uneven aged stands. Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment. Silviculture - objectives - scope - general principles. Regeneration - natural and artificial. Nursery techniques - containerised seedling production - techniques and methods. Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques. Plantation forestry - reforestation and afforestation - maintenance of plantations - enrichment planting. Tending operations - weeding, cleaning, thinning, pruning, after care techniques; cultural operations - soil working. Silvicultural systems - clear felling, shelter wood, selection and coppice systems - improvement felling. Silviculture techniques for some important species - Tropical Species - Acacia spp (indigenous and exotics), Albizia lebbeck, Albizia falcataria, Ailanthus excelsa, Azadirachta indica, Bambusa bambos, B. balcooa, B. vulgaris, Casuarina equisetifolia, C.junghuhniana, Ceiba pentandra, Dalbergia latifolia, D. sissoo, Dendrocalamus strictus, Eucalyptus spp (E. tereticornis, E.camaldulensis, E. grandis, E. globulus), Grevillea robusta, Hardwickia binata, Leucaena leucocephala, Melia dubia, Pongamia pinnata, Populus deltoides, Prosopis juliflora, Pterocarpus santalinus, Santalum album, Syzygium cuminii, Shorea robusta, Tectona grandis, Terminalia spp.(T.chebula, T.bellerica, T.paniculata, T.tomentosa), Tamarindus indica. Temperate Species - Alnus nepalensis, Cedrus deodara, Pinus roxburghii, P. wallichiana, P. patula.

UNIT – II FOREST MENSURATION AND MANAGEMENT

Forest Mensuration - Definition and objectives. Measurement of diameter, girth, height, crown and volume of trees - methods and principles - tree stem form - form factor. Volume estimation of stand - age - basal area determinations Stem and Stump Analysis. Forest inventory - sampling techniques and methods - measurement of crops - sample plots. Yield calculation - CAI and MAI - volume, yield and stand tables preparation. Forest management - objectives and principles. Forest organisation. Sustainable Forest Management (SFM)_- criteria and indicators of SFM - sustained yield - concept and management - arguments for and against sustained yield - Forest Certification - Standards, Procedures and agencies. Rotation - normal forest - increment - growth stock determination. Yield regulation - principles and concepts - Von Montel's formula and its modifications - yield regulation in regular and irregular forests. Working plan - objectives and scope - constitution of working plan division. Enumeration and sampling. Regeneration survey - Plantation journal - divisional working plans - annual plan of operations. Joint forest management. Aerial photography and remote sensing - methods and techniques - GIS for forest management and modelling.

UNIT- III FOREST UTILISATION AND WOOD TECHNOLOGY

Logging - extraction of timber - felling rules and methods - conversion methods - conversion season. Implements used - cross cutting system - sawing - different types - extraction methods. Grading of timbers. Transportation of timbers - major and minor transportation methods Storage and sales of logs - sales depot - management of depots. Recent trends in logging - Ergonomics and RIL. Forest products - Timber - timber, fuel, pulp, paper, rayon and match. Wood Composites - plywood, particle board, fiber boards, MDF, hardboard, insulation boards - production technology. Non timber forest products (NTFP) - collection - processing and storage of NTFP - fibres and flosses - bamboos and canes - katha and bidi leaves - essential oils and oil seeds - gums and resins - tans and dyes - drugs - insecticides - lac and shellac - tassar silk - role of tribal co-operative societies. Wood Science - Macroscopic character of wood - three dimensional structures - structure of heartwood and sapwood - hard wood and soft wood. Composition and structure of wood - chemical components and cell wall structure and formation. Anatomical structures of heartwood and softwood - reaction wood - wood and water relations. Properties of wood - physical properties - specific gravity, density of wood - mechanical properties - gross features of wood. Defects in wood - natural defects. Seasoning of wood - principles and objectives of seasoning - seasoning methods - air and kiln seasoning - seasoning defects. Wood preservation - principles and methods - wood preservatives - definition - kinds of preservatives - method of preservative application - pressure and non-pressure processes - classification of wood based on seasoning behaviour.

UNIT- IV FOREST SURVEYING AND ENGINEERING

Surveying - principles of surveying - errors in surveying - scope of surveying in forestry. Scales - linear measurement. Different methods of surveying - chain, prismatic, compass, plain table and topographic survey. Area calculation - instruments and principles - maps and map reading. Principles of forest engineering - levelling instruments - building materials and construction. Forest roads - objectives - principles and types of forest roads. Causeways and culverts. Bridges - construction of bridges - construction of timber, RCC, steel and suspension bridges - cable roadways and winches.

UNIT - V FOREST SOILS AND SOIL CONSERVATION AND WATERSHED MANAGEMENT

Forest soils - Classification - Factors affecting soil formation - podzolisation and laterization. Physical, chemical and biological properties of forest soils. Problem soils - classification of waste lands - extent of waste lands in India - reclamation of alkaline, saline, water logged and other waste lands - sand dune stabilisation - wind breaks and shelter belts. Soil conservation - definition - objectives - problems - programmes and achievements. Erosion - types and causes - wind, water - management of eroded region. Role of micro organisms in soil amelioration - Use of bio-inoculants Azospirillum, Azotobacter, Phosphobacteria, Rhizobium, VAM, Frankia, and Vermicompost. Soil and water conservation measures. Watershed management - concept and methods - forest treatments - stream flow - water harvesting and conservation - ground water recharge - impact on water yield and quality.

UNIT- VI FOREST ECONOMICS, POLICIES AND LEGISLATIONS

Fundamental principles of forest economics - cost benefit analysis - NPV, IRR analysis - demand and supply estimation. Socio-economic analysis of forest productivity - attitudes and analysis of trends in national and international markets - assessment of market structure. Forest valuation - direct and indirect valuation -stumpage valuing, price size gradients - devastation value - risk management. Project formulation - project monitoring - evaluation - elements of time series analysis and forecasting - role of corporate financing. Forest policies - Necessity - Formulation of National Forest Policy. History of forest development in India - Indian Forest Policy of 1894, 1952 and 1988. NCA report on forestry - role of ICAR and ICFRE in forest research and education. National Mission on Wasteland Development. Forest Organizations and Institutes - National - FRI, IGNFA, FSI, WII, IIFM, IWST, IFGTB, SACON etc. - International - ICRAF, ITTO. Forest laws - necessity - general principles - Indian Forest Act 1927, Forest Conservation Act 1980, Wildlife Protection Act, 1972, Tamil Nadu Forest Act, 1882, Tamil Nadu Timber Transit Rules, 1968, Tamil Nadu Hill Act, 1985 - application of IPC to forests. Recent Policies and Acts - Tribal Bill, 2007, Biodiversity Bill, 2002, National Agroforestry Policy 2014. ITTO, GATT and its relevance to timber export - Rio summit and Kyoto Protocol and its relevance to timber export.

UNIT- VII FOREST BIOLOGY AND BOTANY

Forest ecology - definition - biotic and abiotic components - forest ecosystem - forest community - concepts - succession - primary productivity - nutrient cycling. Composition of forest types in India - classification of India's forests - species composition - association and diversity. Restoration ecology - global warming - green house effects - ozone layer depletion - acid rain - role of trees in environmental conservation. Biodiversity - Definition, origin, types - factors endangering biodiversity - biodiversity hotspots - endemism - Red Data Book. Biodiversity assessments - principles and methods. Forms of trees - structure and function - physiology and reproduction of trees - water relation - physiology in stress environments (drought, water logging, alkalinity and salinity). Seed and its importance. Characters of good quality seeds. Seed dormancy - types and causes - dormancy breaking. Seed collection- physiological maturity - Seed extraction - seed processing. Seed grading and upgrading of seed lots. Seed treatments - principles and methods - seed pelleting. Seed sampling - procedure. Seed testing - purity analysis - moisture estimation - seed germination test - quick viability test. Seed storage - orthodox and recalcitrant seeds - causes of deterioration - seed storage containers. Seed certification procedure - Seed Act and Rules - Quality control and legislation. Forest Botany - Importance of botany - taxonomic classification of plant species - identification of species - composition and association. Dendrology - principles and establishment of herbaria and arboreta. Tree Improvement - Forest Genetics and Tree Breeding - Definition and concepts - Steps in tree improvement - Variation and selection - Progeny Evaluation Test (PET) - Candidate Tree, Plus Tree, Elite trees - use of provenances and seed sources - heritability and genetic gains - hybrids in tree improvement - heterosis exploitation. Seed production Area and seed orchards - types and establishment. *In situ* and *ex situ* gene conservation. Exotics - role of exotic forest trees in India - application of biotechnological methods in forestry.

UNIT – VIII   WILDLIFE BIOLOGY AND MANAGEMENT

Wildlife and wild animals - food chain - prey and predator relationship. Introduction to wildlife management. Ecology and biology of wildlife - principles and techniques of management - Man and Biosphere (MAB) programme - wildlife habitats. Census - methods and application - land tenure system. Major wildlife species in India and their broad study. Wildlife conservation - policies and legal measures - sanctuaries - national parks - biosphere reserves. Ornithology - bird habitats - bird species of India - avian extinction - causes and management. Role of NGOs and others in avian fauna conservation - beneficial and harmful roles of birds. Herpatology - definition and uses. Man and animal interaction - Impact and management. Ecotourism and Recreation Forestry. Management of captive wildlife - captive breeding - diseases of wildlife and their management.

UNIT- IX   FOREST PROTECTION

Role of forest protection in Indian forestry. Injuries caused by various agencies - by human beings, plants, animals, insects, birds, adverse climatic factors. Forest fire - beneficial and adverse causes - fire protection methods and rehabitation. Pests and diseases of economic trees - control measures for pests and diseases for major tree species - biological, chemical and integrated pest and disease management methods. Termites - types and their management. Alien or invasive weeds and their management - forest encroachments and grazing.

UNIT – X AGROFORESTRY AND SOCIAL FORESTRY

Agroforestry - definition, concept and objectives. Classification of agroforestry systems - primary systems and subsystems - inheritance effects. Tree-crop interactions - above and below ground - competition for space, water, light and nutrients. Microclimatic modifications - nutrient cycling and soil fertility improvement - Allelopathy and allelochemicals. - Ecological aspects of agroforestry - benefits and limitations of agroforestry. Agroforestry practices for different agro-climatic zones of Tamil Nadu. Agroforestry practices for wasteland reclamation. Social forestry - objectives and scope and necessity - its components and implementation in local and national levels - social attitudes and community participation. JFM - principles, objectives and methodology - choice of species for agro forestry and social forestry. Urban Forestry - definition and scope - benefits - choice of tree species - planting techiques and management.

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 PALAEONTOLOGY

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 - Petrologcal 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   ENONIMIC GEOLOGY

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 Led 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 GELOLOGY

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.
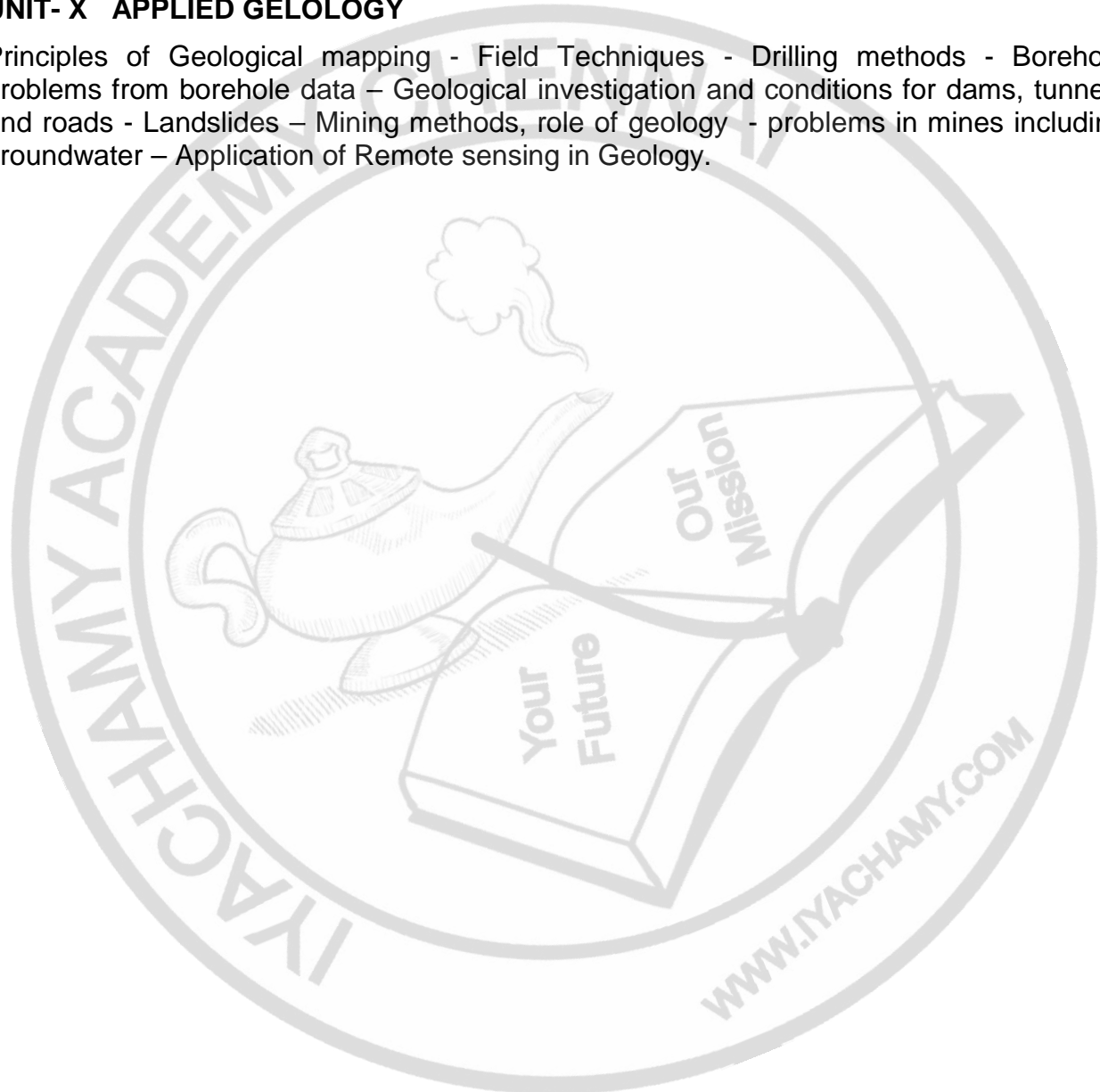
HORTICULTURE
(DEGREE STANDARD)

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, vermi-composting - 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, Tuberose, Chrysanthemum, Marigold, Nerium and Crossandra - Cut flowers - Rose, Carnation, Anthurium, Orchid and Gerbera – Cutfoliage 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 – Astroturf - 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, Oilpalm, 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 *insitu* 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.

MARINE BIOLOGY
(DEGREE STANDARD)

UNIT- I   PHYSICAL OCEANOGRAPHY

Major divisions of marine environment; Physical properties of seawater - Thermal properties of seawater; properties of Waves: Types of waves and properties of ocean waves; Tides - Origin of the tides; Wind and Ocean circulation – Types of currents.

UNIT – II CHEMICAL OCEANOGRAPHY

Chemical properties of seawater : Concept of chlorinity and salinity of seawater; Solubility of gases in seawater: Non reactive gases - Minor reactive gases; Organic matter: Dissolved and Particulate organic matter - Sources and classification; Origin, distribution of nutrients cycle and their significance.

UNIT – III BIOLOGICAL OCEANOGRAPHY

Primary and Secondary Productivity of the coastal environment; Phytoplankton and Zooplankton: Classification, distribution, their role in coastal ecosystems and adaptations. Primary production and factors affecting primary production.

UNIT – IV MARINE ECOLOGY AND POLLUTION

Community ecology; Intertidal ecology - Benthic, pelagic and deep sea ecology - Food Chain and food web; Food pyramid; Animal association in the marine environment. Types of marine pollution, source and their biological effects.

UNIT – V BIODIVERSITY

Biodiversity - Genetic diversity - Species diversity - Ecosystems diversity - Biodiversity changes in time and space - Need for conservation and conservation strategies; IUCN categorization ; Biosphere reserves and National parks; Climate Change and Global warming.

UNIT – VI COASTAL VEGETATION

Coastal vegetation : Intertidal and sublittoral; seaweeds, seagrass and saltmarshes; mangroves – Distribution and adaptations; Economic importance of mangroves.

UNIT – VII MARINE MICROBIOLOGY

Marine microbial environment – Benthic & littoral zone, saltpan, mangroves and estuarine microbes, microbial loop in ocean food webs – Marine microbial community - Bacteria, Fungi, Protozoa. Marine Extremophiles.

## UNIT – VIII   INVERETEBRATES, PROCHORDATES AND VERTEBRATES

Principles and classification; Marine invertebrates and vertebrates - Their biology - Physiology,   locomotion, nutrition and reproduction. Adaptive radiations of bony fishes and elasmobranches. Seaturtles and Mammals.

UNIT – IX CAPTURE FISHERY

Commercial marine fishery resources of India and Tamilnadu - Finfishes (Elasmobranch - Oil Sardine, Mackerel, Bombay duck), crustaceans (shrimp, lobster and crab) and molluscs.

UNIT – X MARICULTURE

Importance of Coastal aquaculture- Present status - Different culture methods; Open sea farming: Cages, pens - Raft – Raceways. Potentialities and socio-economic problems of aquaculture.
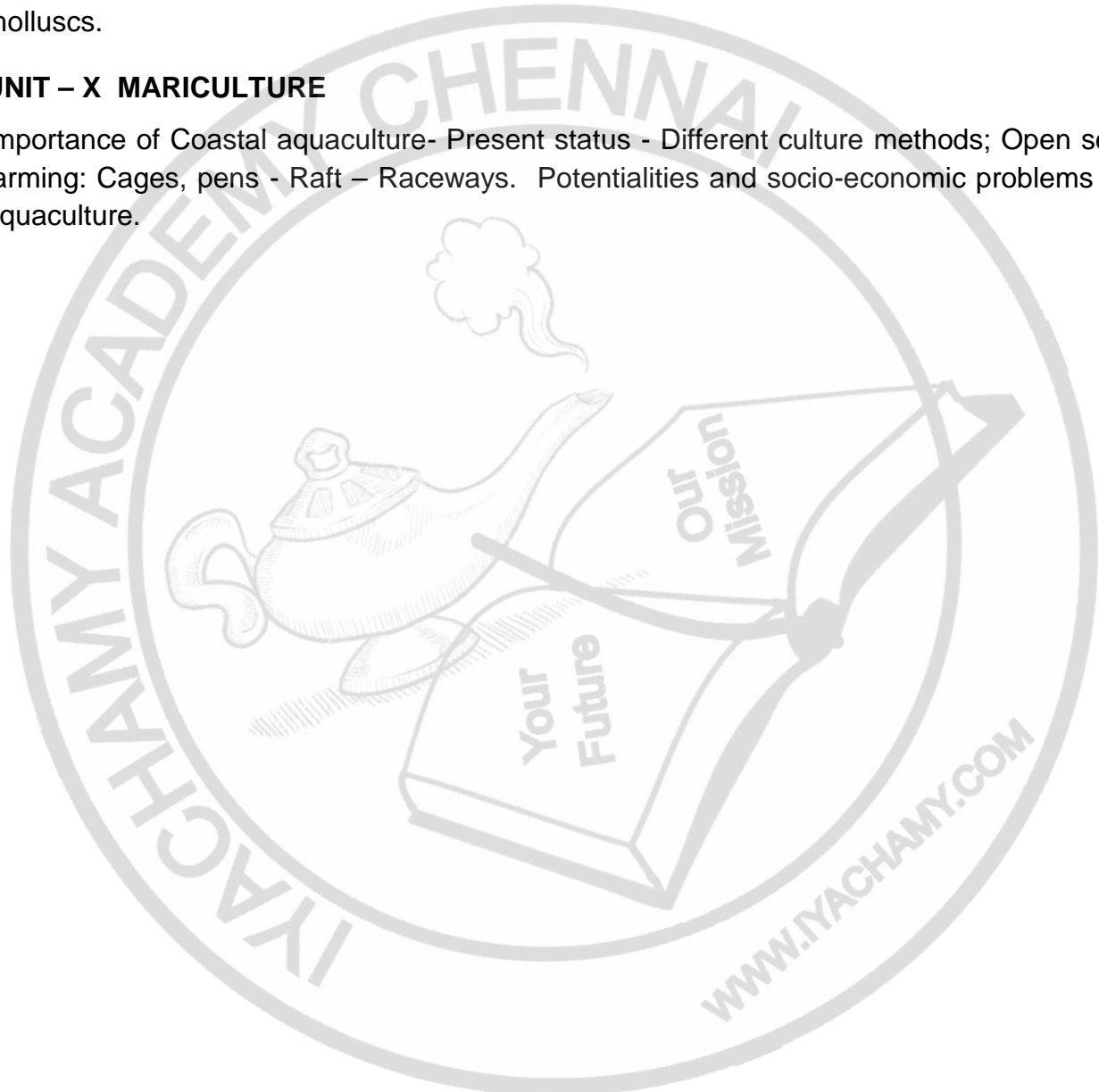
UNIT - I ALGEBRA AND TRIGONOMETRY

Theory of Equations: Polynomial equations; Imaginary and irrational roots; Symmetric functions of roots in terms of coefficient; Sum of rth powers of roots; Reciprocal equations; Transformations of equations.

Descrates' rule of signs: Approximate solutions of roots of polynomials by Newton - Raphson Method - Horner's method; Cardan's method of solution of a cubic polynomial.

Summation of Series: Binomial, Exponential and Logarithmic series theorems; Summation of finite series using method of differences - simple problems.

Expansions of sin x, cos x, tan x in terms of x; sin nx, cos nx, tan nx, sin nx, cos nx , tan nx, hyperbolic and inverse hyperbolic functions - simple problems.

Symmetric; Skew Symmetric; Hermitian; Skew Hermitian; Orthogonal and Unitary Matrices; Rank of a matrix; Consistency and solutions of Linear Equations; Cayley Hamilton Theorem; Eigen values; Eigen Vectors; Similar matrices; Diagonalization of a matrix.

Equivalence relations; Groups; subgroups – cyclic groups and properties of cyclic groups - simple problems; Lagrange's theorem; Prime number; Composite number;. decomposition of a composite number as a product of primes uniquely (without proof); divisors of a positive integer n; congurence modulo n; Euler function; highest power of a prime number p contained in n!; Fermat's and Wilson's theroems - simple problems.

Sums of sines and cosines of n angles which are in A.P.; Summation of trigonometric series using telescopic method, C + i S method.

UNIT - II CALCULUS, COORDINATE GEOMETRY OF 2 DIMENSIONS AND DIFFERENTIAL GEOMETRY

nth derivative; Leibnitz's theorem and its applications; Partial differentiation. Total differentials; Jacobians; Maxima and Minima of functions of 2 and 3 independent variables - necessary and sufficient conditions; Lagrange's method – simple problems on these concepts.

Methods of integration; Properties of definite integrals; Reduction formulae - Simple problems.

Conics - Parabola, ellipse, hyperbola and rectangular hyperbola - pole, polar, co-normal points, con-cyclic points, conjugate diameters, asymptotes and conjugate hyperbola.

Curvature; radius of curvature in Cartesian coordinates; polar coordinates; equation of a straight line, circle and conic; radius of curvature in polar coordinates; p-r equations; evolutes; envelopes.

Methods of finding asymptotes of rational algebraic curves with special cases. Beta and Gamma functions, properties and simple problems. Double Integrals; change of order of integration; triple integrals; applications to area, surface are volume.

UNIT - III DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

First order but of higher degree equations – solvable for p, solvable for x, solvable for y, clairaut's form – simple problems.

Second order differential equations with constant coefficients with particular integrals for e^{ax}, x^m, $e^{ax}\sin mx$, $e^{ax}\cos mx$

Second order differential equations with variable coefficients $ax^2\dfrac{d^2y}{dx^2}+bx\dfrac{dy}{dx}+cy=q(x)$;
Method of variation of parameters; Total differential equations, simple problems.

Partial Differential equations : Formation of P.D.E by eliminating arbitrary constants and arbitrary functions; complete integral; Singular integral ; general integral; Charpit's method and standard types   f(p,q)=0, f(x,p,q)=0, f(y,p,q)=0, f(z,p,q)=0, f(x,p)= f(y,q); Clairaut's form and Lagrange's equations Pp+Qq=R – simple problems.

Laplace transform; inverse Laplace transform(usual types); applications of Laplace transform to solution of first and second order linear differential equations (constant coefficients) and simultaneous linear differential equations – simple problems.

UNIT - IV VECTOR CALCULUS, FOURIER SERIES AND FOURIER TRANSFORMS

Vector Differentiation : Gradient, divergence, curl, directional derivative, unit normal to a surface.

Vector integration: line, surface and volume integrals; theorems of Gauss, Stokes and Green – simple problems.

Fourier Series: Expansions of periodic function of period 2   ; expansion of even and odd functions; half range series.

Fourier Transform: Infinite Fourier transform (Complex form, no derivation); sine and cosine transforms; simple properties of Fourier Transforms; Convolution theorem; Parseval's identity.

UNIT - V   ALGEBRAIC STRUCTURES

Groups: Subgroups, cyclic groups and properties of cyclic groups – simple problems; Lagrange's Theorem; Normal subgroups; Homomorphism; Automorphism ; Cayley's Theorem, Permutation groups.

Rings: Definition and examples, Integral domain, homomorphism of rings, Ideals and quotient Rings, Prime ideal and maximum ideal; the field and quotients of an integral domain, Euclidean Rings.

Vector Spaces: Definition and examples, linear dependence and independence, dual spaces, inner product spaces.

Linear Transformations: Algebra of linear transformations, characteristic roots, matrices, canonical forms, triangular forms.

UNIT - VI   REAL ANALYSIS

Sets and Functions: Sets and elements; Operations on sets; functions; real valued functions; equivalence; countability; real numbers; least upper bounds.

Sequences of Real Numbers: Definition of a sequence and subsequence; limit of a sequence; convergent sequences; divergent sequences; bounded sequences; monotone

sequences; operations on convergent sequences; operations on divergent sequences; limit superior and limit inferior; Cauchy sequences.

Series of Real Numbers: Convergence and divergence; series with non-negative numbers; alternating series; conditional convergence and absolute convergence; tests for absolute convergence; series whose terms form a non-increasing sequence; the class l^2.

Limits and metric spaces: Limit of a function on a real line; metric spaces; limits in metric spaces.

Continuous functions on Metric Spaces: Functions continuous at a point on the real line, reformulation, functions continuous on a metric space, open sets, closed sets, discontinuous functions on the real line.

Connectedness Completeness and compactness: More about open sets, connected sets, bounded sets and totally bounded sets, complete metric spaces, compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.

Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral properties of Riemann integral, derivatives, Rolle's theorem, Law of mean, Fundamental theorems of calculus, Taylor's theorem.

Sequences and Series of Functions. Pointwise convergence of sequences of functions, uniform convergence of sequences of functions.

UNIT - VII COMPLEX ANALYSIS

Complex numbers: Point at infinity , Stereographic projection

Analytic functions: Functions of a complex variable , mappings, limits , theorems of limits, continuity, derivatives, differentiation formula, Cauchy-Riemann equations, sufficient conditions Cauchy-Riemann equations in polar form, analytic functions, harmonic functions.

Mappings by elementary functions: linear functions, the function $1/z$, linear fractional transformations , the functions $w=z^n$, $w=e^z$, special linear fractional transformations.

Integrals: definite integrals, contours , line integrals, Cauchy-Goursat theorem, Cauchy integral formula, derivatives of analytic functions, maximum moduli of functions.

Series: convergence of sequences and series,Taylor's series, Laurent's series, zero's of analytic functions.

Residues and poles: residues, the residue theorem, the principal part of functions, poles, evaluation of improper real integrals, improper integrals, integrals involving trigonometric functions, definite integrals of trigonometric functions

UNIT - VIII   DYNAMICS AND STATICS

DYNAMICS: kinematics of a particle, velocity, acceleration, relative velocity, angular velocity, Newton's laws of motion, equation of motion, rectilinear motion under constant acceleration, simple harmonic motion.

Projectiles : Time of flight, horizontal range, range in an inclined plane. Impulse and impulsive motion, collision of two smooth spheres, direct and oblique impact-simple problems.

Central forces : Central orbit as plane curve, p-r equation of a central orbit, finding law of force and speed for a given central orbit, finding the central orbit for a given law of force.

Moment of inertia : Moment of inertia of simple bodies, theorems of parallel and perpendicular axes, moment of inertia of triangular lamina, circular lamina, circular ring, right circular cone, sphere (hollow and solid).

STATICS: Types of forces, Magnitude and direction of the resultant of the forces acting on a particle, Lami's Theorem, equilibrium of a particle under several coplanar forces, parallel forces, moments, couples-simple problems.

Friction: Laws of friction, angle of friction, equilibrium of a body on a rough inclined plane acted on by several forces, centre of gravity of simple uniform bodies, triangular lamina, rods forming a triangle, trapezium, centre of gravity of a circular arc, elliptic quadrant, solid and hollow hemisphere, solid and hollow cone, catenary-simple problems.

UNIT - IX   OPERATIONS RESEARCH

Linear programming – formulation – graphical solution – simplex method

Big-M method – Two-phase method-duality- primal-dual relation – dual simplex method – revised simplex method – Sensitivity analysis.

Transportation problem – assignment problem.

Sequencing problem – n jobs through 2 machines – n jobs through 3 machines – two jobs through m machines – n jobs through m machines

PERT and CPM : project network diagram – Critical path (crashing excluded) – PERT computations.

Queuing theory – Basic concepts – Steady state analysis of M/M/1 and M/M/systems with infinite and finite capacities.

Inventory models : Basic concepts - EOQ models : (a) Uniform demand rate infinite production rate with no shortages (b) Uniform demand rate Finite production rate with no shortages – Classical newspaper boy problem with discrete demand – purchase inventory model with one price break.

Game theory : Two-person Zero-sum game with saddle point – without saddle point – dominance – solving 2 x n or m x 2 game by graphical method.

Integer programming : Branch and bound method.

UNIT – X MATHEMATICAL STATISTICS

Statistics – Definition – functions – applications – complete enumeration – sampling methods – measures of central tendency – measures of dispersion – skewness-kurtosis.

Sample space – Events, Definition of probability (Classical, Statistical & Axiomatic) – Addition and multiplication laws of probability – Independence – Conditional probability – Bayes theorem – simple problems.

Random Variables (Discrete and continuous), Distribution function – Expected values & moments – Moment generating function – probability generating function – Examples.

Characteristic function – Uniqueness and inversion theorems – Cumulants, Chebychev's inequality – Simple problems.

Concepts of bivariate distribution – Correlation : Rank correlation coefficient – Concepts of partial and multiple correlation coefficients – Regression : Method of Least squares for fitting Linear, Quadratic and exponential curves - simple problems.

Standard distributions – Binomial, Hyper geometric, Poission, Normal and Uniform distributions – Geometric, Exponential, Gamma and Beta distributions, Inter-relationship among distributions.

Sampling Theory – sampling distributions – concept of standard error-sampling distribution based on Normal distribution : t, chi-square and F distribution.

Point estimation-concepts of unbiasedness, consistency, efficiency and sufficiency-Cramer Rao inequality-methods of estimation : Maximum likelihood, moments and minimum chi-square and their properties.

Test of Significance-standard error-large sample tests. Exact tests based on Normal, t, chi-square and F distributions with respect to population mean/means, proportion/proportions variances and correlation co-efficient. Theory of attributes – tests of independence of attributes based on contingency tables – goodness of fit tests based on Chi-square.

Analysis of variance : One way, two-way classification – Concepts and problems, interval estimation – confidence intervals for population mean/means, proportion/proportions and variances based on Normal, t, chi-square and F.

Tests of hypothesis : Type I and Type II errors – power of test-Neyman Pearson Lemma – Likelihood ratio tests – concepts of most powerful test –simple problems
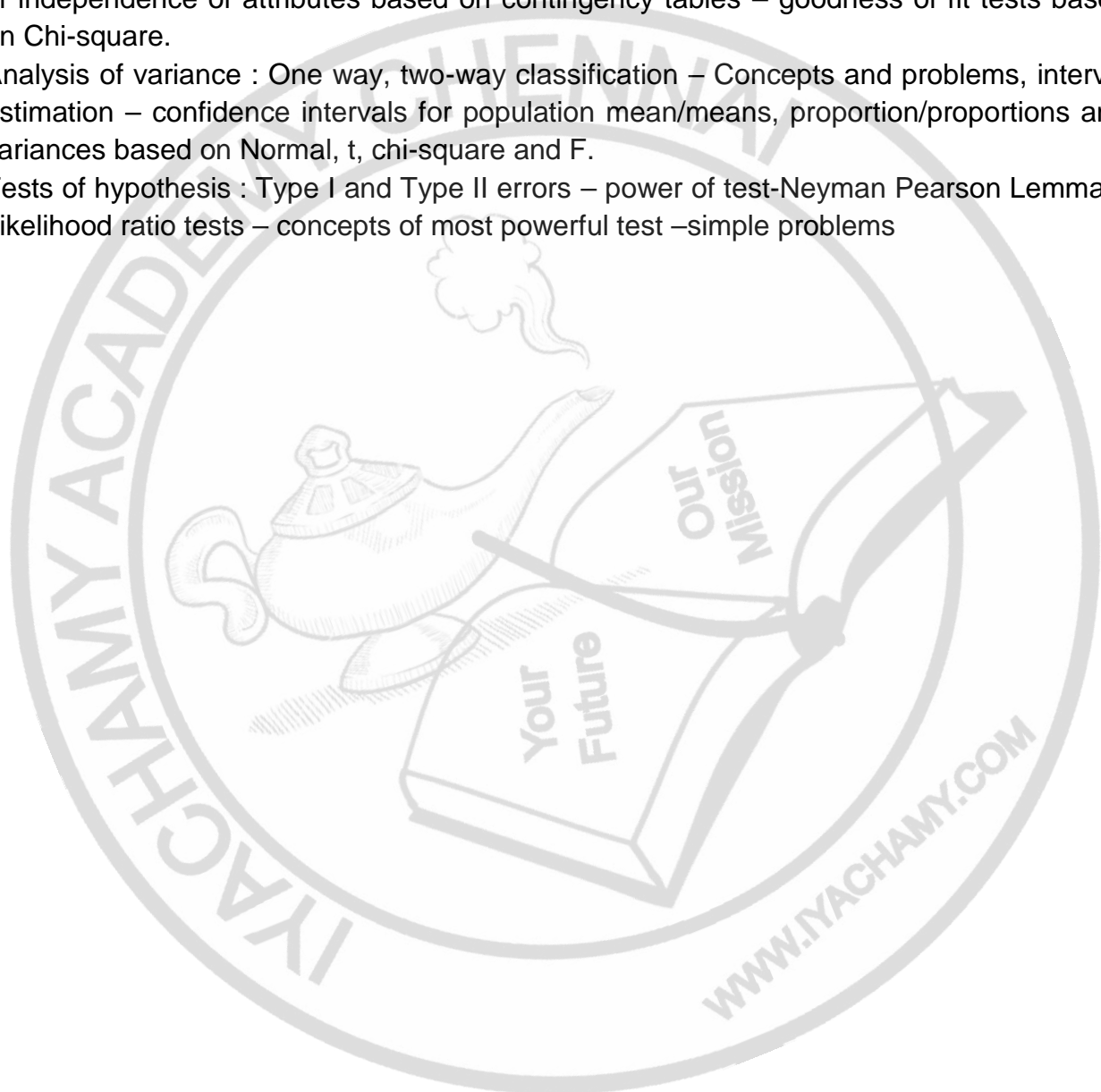
PHYSICS
(DEGREE STANDARD)

UNIT – I MECHANICS AND RELATIVITY

Gravitation- Kepler's law- Gravitational constant and their determination variation of 'g' - Centre of gravity - Centre of gravity of a solid hemisphere - Hollow hemisphere - Tetrahedron and solid cone - Friction – Lubricants - Laws of friction - Cone of friction - angle of friction - Equilibrium of a body in a inclined plane - Impulse – Impact- Laws of Impact - Direct and oblique impact - Impact between two spheres - Loss of Kinetic energy – Moment of Inertia - Angular momentum and Kinetic energy of a revolving body - Moment of inertia of a sphere, shell and cylinder - Compound pendulum - Newton's laws and their limitations - postulates of special theory of relativity - Lorentz transformation equations and its applications - variation of Mass with Velocity - Mass - energy equivalence – Physical significance

UNIT – II PROPERTIES OF MATTER

Elastic moduli - Relations - Couple per unit twist - Torsional oscillations - Bending of beams - Uniform and Non uniform bending - Elastic constants and their determinations - Viscosity of liquids - Highly viscous liquids – Stoke's and Searle's method- Surface Tension - Capillary rise - Method of drops - Surface tension of mercury - Quincke's Method - Laws of osmotic pressure and experimental determination of osmotic pressure- Fick's laws of diffusion - Determination of diffusivity – Applications

UNIT - III HEAT AND THERMODYNAMICS

Specific heat capacity – Determination of specific heat capacity by Newton's law of cooling- Debye's theory- Mayer's relation -   Vanderwaal's equation - Critical constants and Vanderwaal's constant - J K effect - Theory and experiment – Liquefaction of gasses – Hydrogen - Helium - Thermal conductivity - Forbe's method - Stefan's law - Experimental determination of Stefan's constant- Solar constant - Temperature of the sun
Zeroth, first law and second laws of thermodynamics - Isothermal and adiabatic change - Reversible and irreversible process - Carnot's theorem- Carnot engine - Carnot cycle - Entropy -   Maxwell's thermo dynamical relations and its applications - Third law of thermodynamics

UNIT- IV SOUND

Simple harmonic motion - Composition of two SHMs along a straight line and at right angles - Lissajou's figures - Laws of transverse vibrations - verification by sonometer and Melde's string - Forced vibrations and resonance - Beats - Doppler effect - Velocity of sound in solids and gases – Theory and experiment - Ultrasonics - production, properties and applications - Acoustics of buildings

UNIT- V OPTICS AND SPECTROSCOPY

Spherical aberration - Chromatic aberration and their rectifications – Coma- Eyepiece - Ramsden's and Huygen's eyepieces - Interference - Colours of thin films - Newton's rings - Theory and experiment - diffraction – Fresnel's and Fraunhofer types - Zone plate - Diffraction grating – Prism- Grating spectra - dispersive and resolving power of a grating - Double refraction - Huygen's explanation – Nicol's prism - Quarter and half wave plates - Production and detection of plane, circular and elliptically polarized light - optical activity - Determination of specific rotatory power – Polarimeter

UV and IR Spectroscopy - Principle and application - Raman effect - Explanation of Raman effect on the basis of quantum theory - Applications of Raman effect - Optical fiber - Fiber optic sensors - Fiber optic communication systems and their advantages - Lasers - Population inversion - Ruby and Helium Neon Lasers and applications

UNIT - VI WAVE MECHANICS

De Broglie concept of wave theory- Wave velocity and group velocity- De Broglie relations – Heisenberg's uncertainty principle – Basic postulates of wave mechanics- Schrodinger's Wave equation - Eigen function and Eigen values- Particle in a box – Linear harmonic oscillator (one dimension only)

UNIT - VII ELECTRICITY AND MAGNETISM

Coublom's law - Permitivity of free space - Relative permitivity - Electric field - Intensity of field due to a point charge - Guass theorem and its application - Electric potential - Relation between potential and intensity - Electric dipole moment - potential and intensity due to a dipole- Capacitance - Capacity of a spherical, parallel and cylindrical capacitors - Energy of a charge capacitor - Dielectric constant - Ohm's law - Resistivity and conductivity - Internal resistance of a cell - EMF and Potential difference - Thermo Electricity - Peltier and Thomson Co Efficients - Laws of Electrolysis - Conductivity of an electrolyte Arrheinius theory of electrolytic conduction - Calculation of emf of Daneil cell as reversible cell

Magnetic field around a current carrying conductor - Biot and Savart's law - Ampere's law of magnetic force due to a current - Force between two current carrying parallel conductors- Force on an electron moving in a magnetic field - Faraday's laws of electromagnetic induction - Self and mutual inductance - Induction coils and its uses - Eddy currents - Transformers - Energy losses - Skin effect - Advantages of AC distribution over DC - Dynamos and motors -

Magnetic poles - Magnetic moments - Susceptibility - Relation between susceptibility and permeability - Hysteresis - Dia, para, ferro magnetism - Electromagnetic waves in free space.

UNIT- VIII ELECTRICAL CIRCUITS AND ELECTRONICS

Kirchoff's laws for a loop and a junction - Measurements of circuit parameters   (R,L and C) - AC circuits - Complex impedance and phase diagram – LCR Circuits - Series and parallel resonant circuits - Sharpness of resonance q factor.

Semiconductors - Energy band theory of solid - Insulators - Conductors and Semiconductors - Intrinsic and extrinsic semiconductors - Electrons and holes as charge carriers - P-type and N-type semiconductors - Junction diodes - Characteristics of a diode - Diode applications - Junction transistors -   characteristic of transistors - Rectifier, Amplifier and oscillator circuits - AM and FM transmission with block diagrams - Basic principles of super heterodyne receiver with block diagram - Photo conductive cell - Photo diode - Solar cell - LED and LCD - construction and working T.V Camera - Vertical and Horizontal scanning - T.V Transmission and reception with block diagrams - T.V Antenna (Yogi type) - Colour TV - Three colour theory - Radar - Uses of radar.

Logic circuits - AND, OR, NOT NAND, NOR and EX-OR gates - Truth tables - Multivibrators - Astable multivibrators - Flip flop circuits (RS and JK flip flops)

UNIT - IX MODERN PHYSICS

Canal rays - e/m of positive ions - Thomson's parabola method - Aston's mass spectrograph - Plank's quantum theory of black body radiation - Photoelectric effect - photo electric multipliers - Einstein's equation for photo electric effect - Millikan's experiment - Determination of Plank's constant.

Bohr's theory of hydrogen atom - Spectra of Hydrogen and Hydrogen like atoms - Rydberg's constant - Spatial quantization - Sommerfeld atom model – Vector atom model- Seven quantum numbers -   Pauli's exclusion principle - Examples of electronic configuration – Magnetic moment due to orbital motion and electron spin - Bohr magnetron - Experimental verification - Fine structure of sodium D Line - Zeeman effect - Anomalous Zeeman effect - Theoretical explanation

UNIT- X NUCLEAR AND SOLID STATE PHYSICS

Properties of nucleus - size, charge, mass and spin - Nuclear magnetic dipole moment - Binding energy - Packing fractions - Nuclear forces - Nuclear models - Shell model and liquid drop model - Nuclear reactions – Radio activity and induced radio activity- Artificial transmutation Techniques - Application of Radio isotopes - Discovery, Production and detection of neutron - Accelerators - Betatron - Proton Synchrotron - Particle Detectors - Ionization chamber - GM counter - Elementary particle – Baryons and Leptons – Cosmic rays

Structure of crystals - Periodicity and plane in crystal - Symmetry elements and symmetry groups - Classification of crystals - Unit cell and crystal types Bonding - ionic, covalent, metallic and Vander wall's- X-rays - Bragg's law and absorption of X rays - Mosley's law - Compton effect

STATISTICS
(DEGREE STANDARD)

SUBJECT CODE 274

UNIT- I

Uses, Scope and limitation of Statistics, Collection, Classification and Tabulation of data, Diagramatic 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 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, Net work – 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.

WILDLIFE BIOLOGY
(DEGREE STANDARD)

SUBJECT CODE 291

UNIT - I SCOPE AND IMPORTANCE OF WILDLIFE OF INDIA

Definition of Wildlife: Causes of wildlife depletion; Economic importance of wildlife; need for wildlife conservation; rare, endangered, threatened and endemic species of fishes, amphibians, reptiles, birds and mammals in India- India as a mega wildlife diversity country.

UNIT - II FORESTRY, SILVICULTURE AND FOREST ENTOMOLOGY

Forest types in India- identification, dendrology; Deforestation & Impacts; Forest Inventory; Natural and artificial regeneration of forests; nursery techniques-seed-technology-Collection, storage, pretreatment and germination, establishment and tendings; Sylvicultural systems – Clear felling, uniform, shelter – selection, Coppice and conversion system; Agro forestry systems - Social/Urban Forestry- Joint Forest Management-Indian Forest Act 1927, Forest Conservation Act 1980; Harmful Insects and their role in forest economy: Insect pests of important trees of India -Teak, Sal and Bamboo; Beneficial Insects and their role in forest economy: Scavenger insects- dung beetles; Pollinators, Predatory insects, and parasitic insects on insect pests; control of forest insects.

UNIT – III BEHAVIOUR OF WILDLIFE

Instinctive behaviour-classical and modern concepts-fixed action pattern and ritualization; Learning-Imprinting-habituation. Analysis of behaviour pattern- taxis, kinesis and reflexes; Biological rhythms and bird migration; Types of animal communications; Courtship, display, sexual selection and parental care in mammals and birds; Social behaviour in animals - Honey bees, Elephants.

UNIT – IV WILDLIFE MANAGEMENT TECHNIQUES

Vegetative analyses – Point Centered Quadrat, Quadrat, Strip transect; GIS and Remote sensing in wildlife habitat surveys-Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species; Making observations and records: field notes, datasheets; Wildlife Photography - Types of cameras, camera traps; Field equipments-altimeter, pedometer, field compass, binoculars; radio collaring; GPS; GIS; Remote sensing in Wildlife management.

UNIT - V WILDLIFE CENSUS TECHNIQUES

Planning census – Total counts - Sample counts – Basic concepts and applications - Direct count (block count, transect methods, Point counts, visual encounter survey, waterhole survey); Indirect count (Call count, track and signs, pellet count, pugmark, camera trap)-Identifying animals based on indirect signs; Capture-recapture techniques.

UNIT – VI HUMAN WILDLIFE CONFLICTS

Basic concepts, reasons for conflicts, Identification of damages caused by wild animals and control measures; Case studies – Elephant, gaur, wild boar, monkey, tiger and leopard; Translocation of Wild animals – Principles, Methods and applications.

UNIT – VII   HEALTH CARE OF WILDLIFE

Infectious wildlife diseases: Viral diseases: Rabies-Rinderpest-Foot and Mouth -Viral encephalitis-Yellow fever- Bacterial disease: Anthrax-Brucellosis – Clostridiosis - Listeriosis.
Protozoan disease: Trypanosomiasis -Toxoplasmosis-Babesiosis - Coccidiosis.
Helminth disease: Fasciolopsis – Schistosomiasis – Taeniosis - Hydatidosis
Non-infectious diseases of wild animals: Diseases of the digestive system: Stomatitis-catarrhal, gastroenteritis-haemorrhagic gastroenteritis; Respiratory system: Catarrhal, bronchopneumonia-exudative pleurisy; Excretory system: Paralysis of urinary bladder-urolithiasis;

UNIT – VIII   CONSERVATION OF WILDLIFE

in-situ and *ex-situ* conservation: Wildlife Sanctuaries, National Parks, Tiger Reserves and Biosphere reserves: Definition, formation, management and administration; Wildlife Projects: Tiger, Elephant, Lion and Hangul; Zoos and Zoological Parks: Definition- Aims of Zoos- Formation and Management of Zoos and Zoological Parks - Central Zoo Authority of India; Captive breeding: Aims, Principles, methods; Role of Government and Non-Governmental organizations in conservation;

UNIT IX MODERN CONCEPTS IN WILDLIFE CONSERVATION

Wildlife Crimes: Wildlife forensics and its applications in detecting wildlife crimes; Wildlife Toxicology: Types of contaminants, methods of toxicity evaluation, bioconcentration-bioaccumulation and biomagnifications; impacts of pesticides and heavy metals on birds and mammals; CAMP and PHVA – Analyses and Reports; Environmental Impact Assessment (EIA) methods and their role in wildlife conservation.

UNIT – X WILDLIFE ADMINISTRATION AND LEGISLATION:

Administrative set up - Advisory bodies- National Board for Wildlife –Wildlife (Protection) Act, 1972 and its Amendments; Wildlife trade and regulations; Biodiversity Act 2000; Eco-Development, Eco- Restoration and Ecotourism programmes; Anti poaching operations – Village Forest Council (VFC).

ZOOLOGY
(DEGREE STANDARD)

SUBJECT CODE 270

UNIT - I

Non-Chordata: General organisation - Classification with diagnostic features upto classes. Evalutionary relationship among taxa, symmetry.

Protozoa: Structure, reproduction and life history of Amoeba, Paramecium, Trypanosoma, Plasmodium, Monocystis, Leishmania - locomotion, nutrition, economic importance.

Porifera: Sponges canal system, skeleton, reproduction and economic importance.

Coelenterata: Diploblastic organization - life history of obelia and Aurelia, Metagenesis - Polymorphism in Hydrozoa. Corals and Coral formation - relationships of Cnidaria and Acnidaria. Helminthes: Structure and life history of Planaria, Fasciola, Teania, Ascaris and Wucheriria - parasitic adaptations - Helminthes in relation to man.

Annelida: Nereis, earthworm and leech - Coelom and metamerism - modes of life in polychactes. Onychophora: Structure, affinities and distribution of Peripatus.

Arthropoda: Prawn, Scorpion and Cockroach - Larval forms and parasitism in Crustacea - Mouth parts, vision, respiration and excretion. Metamorphosis and social life in insects.

Mollusca: Freshwater mussel, pila, sepia. Echinodermata: General organisation - Water vascular system. Larval forms and affinities.

UNIT - II

Prochordata: Amphioxus, Balanoglossus - Ascidian retrogressive Metamorphosis, neoteny and affinities.

Chordata: General Organisation - Characters, Outline, classification upto class level.

Pisces: Locomotion, migration, respiration, Parental care, economic importance; structure and affinities of dipnoi.

Amphibia: Origin of amphibians – Respiration, Parental care - South Indian amphibians.

Reptiles: Origin - Conquest of land - adaptations to live on land, adaptive radiation - Temporal Vacuities - identification of poisonous and non-poisonous snakes - poison apparatus – South Indian snakes.

Birds: Origin - flight adaptations - mechanism of flight - double respiration - migration - Flightless birds.

Mammals: Dentition, skin derivatives - distribution - adaptive radiation. Protothria, Metatheria, eutheria and their Phylogenetic relationships.

UNIT - III

Cell and Molecular Biology: Cellular Organelles - Structure and function - Plasma membrane, Mitochondria, Golgi bodies, Endoplasmic reticulum and Ribosomes – Nucleus and Nucleolus.   Cell division, cell cycle; Chromosomes - DNA structure and function, replication of DNA, Genetic code - RNA and protein synthesis. Gene expression, regulation of gene expression in prokaryotes and Eukaryotes. Recombinant DNA - Genetic engineering, its uses in agriculture, industries and medicine.

UNIT- IV

Genetics: Mendelian concepts, multiple alleles, blood groups, Rh-factor. Linkage, crossing over - mutation (Natural and induced); Sex chromosomes, Sex determination and Sex Linked inheritance - Chromosome number and form ploidy - cytoplasmic inheritance – Karyo types – chromosome mapping, Normal and abnormal genetic disorders; Bio-chemical genetics – Eugenics. Human genome Project. Bio-statistics: Mean, Median and standard deviation. Bio-informatics: DNA and Protein sequence analysis, Prediction functional structure, protein folding, Phylogenetic tree construction.

UNIT - V

Bio Chemistry: Bio-molecules, Structure and role of carbohydrates, lipids, proteins and amino acids - Glycolysis and kreb's cycle - oxidation, reduction - oxidative phosphorylation - energy conservation and release, cyclic AMP, ATP; enzymes – mechanism; Hormones-classification biosynthesis and function.

Physiology: With reference to mammals, digestion, nutrition, balanced diet - assimilation, intermediary/metabolism. Composition of blood - Coagulation, Transport of oxygen, Carbon dioxide, Blood pigments, Mechanism of respiration. Muscles, mechanism of muscle contraction. Temperature regulation, Acid base balance and homeostasis, Nerve impulses and conduction, neurotransmitters.

Receptors- photo, phono and chemo reception. Nephron and urine formation. Endocrine glands, testis, ovary and pituitary organs and their inter relationship. Physiology of reproduction in humans, Hormonal development in insects, pheromones and their uses. Bioluminescence. Biological clock. Physiology of immune response- Antigens – Immuno globulins - humoral and cell mediated immunity. T and B cells, mechanism of antibody formation - Immunodeficiency diseases; vaccination.

UNIT - VI

Development Biology: Gametogenesis – fertilization, Pathenogenesis, type of eggs – blastulation, cleavage and gastrulation in frog and chick. Morphogenetic movements – organizer, potency, organogenesis with reference to ear, eye, kidney, brain. Formation and fate of extra embryonic membranes in chick.

Plancentation- types, functions. - metamorphosis in Frog – Regeneration. Stem cells-sources, types and their uses in human welfare, IVF, embryo transfer and cloning - Aging and senescence.

UNIT - VII

Environmental Biology: Biotic and abiotic factors, their role, Intra and inter specific association. Biogeochemical cycles. Ecosystem- structure and function of ecosystems, types of ecosystems. Ecological succession, Community structure - Stratification. Population and Population dynamic - Habitat ecology. Wild life, need for conservation management and methods of conservation. Sanctuaries with special reference to Tamil Nadu. Pollution - air, water and land - Perspective policy planning for the environment.

UNIT - VIII

Evolution: Origin of life - Evolutionary theories - Contributions of Lamarck, Darwin and De Vries - present status of Darwinism and Lamarkism - modern synthetic concept - Hardy Weinberg Law - Polymorphism and mimicry in evolution. Speciation: evolutionary species concept – Isolation, mechanisms and their role, role of hybridization in evolution. Fossils and Fossilization, Indian fossils, Geological time scale. Origin and evolution of horse and man - Culture evolution and Biochemical evolution.

Animal distribution: Zoogeographical distribution - Continental and island fauna - Continental drift - Discontinuous distribution, adaptive radiation. Natural resources and their conservation. Alternative sources of energy.

UNIT - IX

Economic Zoology: Parasitism and Commensalism - Protozoan Parasites and diseases, helminthes parasites and diseases of man and domestic animals; Beneficial and harmful insects. Insect pests on crops and stored products - Control methods. IPM. Sericulture, apiculture, lac culture, seaweed culture, vermiculture, - oyster culture and pearl formation, poultry, pisciculture and induced breeding, Shell fisheries, Aquaculture practices in Tamil Nadu and their impact on the environment and on agriculture.

UNIT - X

Instrumentation and Bio-techniques: Microscopy-Phase contrast, fluorescent, TEM, SEM. Colorimetric techniques, Centrifugation techniques. Fixation, staining techniques. Electrophoretic techniques: Principles, AGE and PAGE. DNA finger printing, RFLP, RAPD and AFLP.
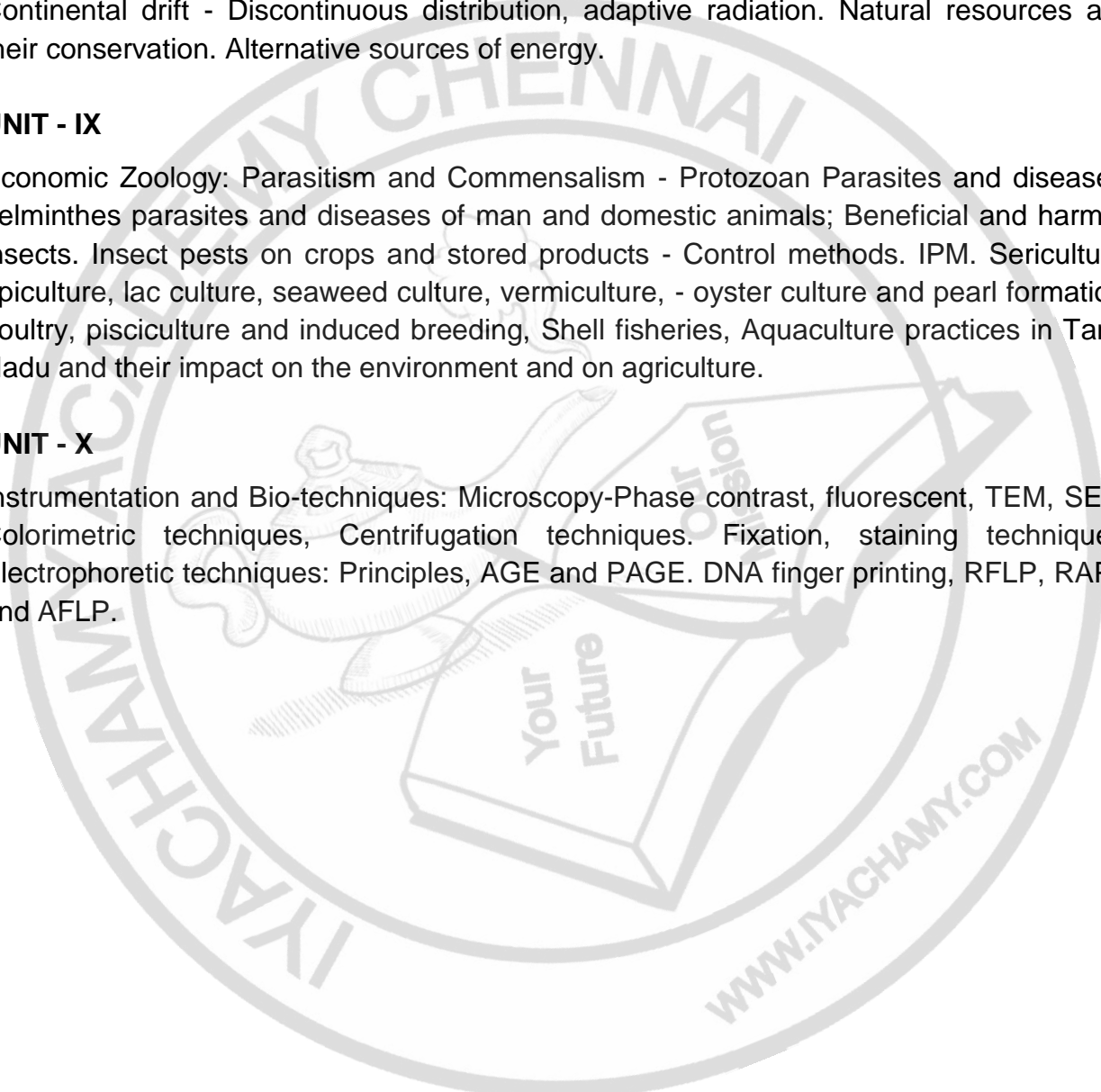
PAPER – III GENERAL STUDIES
TOPICS FOR OBJECTIVE TYPE

UNIT - I GENERAL SCIENCE

PHYSICS Universe-General Scientific laws-Scientific instruments-Inventions and discoveries-National scientific laboratories-Science glossary-Mechanics and properties of matter-Physical quantities, standards and units-Force, motion and energy-Electricity and Magnetism, Electronics and Communication -Heat, light and sound-Atomic and nuclear physics-Solid State Physics – Spectroscopy- Geophysics - Astronomy and space science
CHEMISTRY Elements and Compounds-Acids, bases and salts-Oxidation and reduction-Chemistry of ores and metals-Carbon, nitrogen and their compounds-Fertilizers, pesticides, insecticides-Biochemistry and biotechnology-Electrochemistry-Polymers and plastics
BOTANY-Main Concepts of life science-The cell-basic unit of life-Classification of living organism-Nutrition and dietetics-Respiration-Excretion of metabolic waste-Bio-communication
ZOOLOGY-Blood and blood circulation-Endocrine system-Reproductive system-Genetics the science of heredity-Environment, ecology, health and hygiene, Bio- diversity and its conservation-Human diseases-Communicable diseases and non- communicable diseases- prevention and remedies- Alcoholism and drug abuse-Animals, plants and human life

UNIT- II CURRENT EVENTS

HISTORY--Latest diary of events – National--National symbols-Profile of States-Defence, national security and terrorism-World organizations-pacts and summits-Eminent persons & places in news-Sports & games-Books & authors -Awards & honours-Cultural panorama-Latest historical events-- India and its neighbours-- Latest terminology- Appointments-who is who?
POLITICAL SCIENCE -1. India's foreign policy-2. Latest court verdicts – public opinion-3. Problems in conduct of public elections-4. Political parties and political system in India-5. Public awareness & General administration-6. Role of Voluntary organizations & Govt.,-7. Welfare oriented govt. schemes, their utility
GEOGRAPHY Geographical landmarks-Policy on environment and ecology—
ECONOMICS--Current socio-economic problems-New economic policy & govt. sector
SCIENCE-Latest inventions on science & technology-Latest discoveries in Health Science-Mass media & communication

UNIT - III GEOGRAPHY

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

UNIT - IV   HISTORY AND CULTURE OF INDIA

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

UNIT-V INDIAN POLITY

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

UNIT- VI INDIAN ECONOMY

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

UNIT-VI INDIAN NATIONAL MOVEMENT

National renaissance-Early uprising against British rule-1857 Revolt- Indian National Congress-Emergence of national leaders-Gandhi, Nehru, Tagore, Nethaji -Growth of militant movements -Different modes of agitations-Era of different Acts & Pacts-World war & final phase struggle-Communalism led to partition-Role of Tamil Nadu in freedom

struggle - Rajaji, VOC, Periyar, Bharathiar & Others-Birth of political parties /political system in India since independence

UNIT - VII APTITUDE & MENTAL ABILITY TESTS

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

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