Amrita University's Amrita Values Programme (AVP) is a new initiative to give exposure to students about richness and beauty of Indian way of life. India is a country where history, culture, art, aesthetics, cuisine and nature exhibit more diversity than nearly anywhere else in the world.

Amrita Values Programmes emphasize on making students familiar with the rich tapestry of Indian life, culture, arts, science and heritage which has historically drawn people from all over the world.

Students shall have to register for any two of the following courses, one each in the third and the fourth semesters, which may be offered by the respective school during the concerned semester.

Courses offered under the framework of Amrita Values Programmes I and II

Message from Amma’s Life for the Modern World
Amma’s messages can be put to action in our life through pragmatism and attuning of our thought process in a positive and creative manner. Every single word Amma speaks and the guidance received in on matters which we consider as trivial are rich in content and touches the very inner being of our personality. Life gets enriched by Amma's guidance and She teaches us the art of exemplary life skills where we become witness to all the happenings around us still keeping the balance of the mind.

Lessons from the Ramayana
Introduction to Ramayana, the first Epic in the world – Influence of Ramayana on Indian values and culture – Storyline of Ramayana – Study of leading characters in Ramayana – Influence of Ramayana outside India – Relevance of Ramayana for modern times.

Lessons from the Mahabharata
Introduction to Mahabharata, the largest Epic in the world – Influence of Mahabharata on Indian values and culture – Storyline of Mahabharata – Study of leading characters in Mahabharata – Kurukshetra War and its significance - Relevance of Mahabharata for modern times.

Lessons from the Upanishads
Introduction to the Upanishads: Sruti versus Smrti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The

Upanishads and Indian Culture – Relevance of Upanishads for modern times – A few Upanishad Personalities: Nachiketas, SatyakamaJabala, Aruni, Shvetaketu.

Message of the Bhagavad Gita

Life and Message of Swami Vivekananda
Brief Sketch of Swami Vivekananda’s Life – Meeting with Guru – Disciplining of Narendra - Travel across India - Inspiring Life incidents – Address at the Parliament of Religions – Travel in United States and Europe – Return and reception India – Message from Swamiji’s life.

Life and Teachings of Spiritual Masters India
Sri Rama, Sri Krishna, Sri Buddha, Adi Shankaracharya, Sri Ramakrishna Paramahamsa, Swami Vivekananda, Sri Ramana Maharshi, Mata Amritanandamayi Devi.

Insights into Indian Arts and Literature
The aim of this course is to present the rich literature and culture of Ancient India and help students appreciate their deep influence on Indian Life - Vedic culture, primary source of Indian Culture – Brief introduction and appreciation of a few of the art forms of India - Arts, Music, Dance, Theatre.

Yoga and Meditation
The objective of the course is to provide practical training in YOGA ASANAS with a sound theoretical base and theory classes on selected verses of Patanjali’s Yoga Sutra and Ashtanga Yoga. The coverage also includes the effect of yoga on integrated personality development.

Kerala Mural Art and Painting
Mural painting is an offshoot of the devotional tradition of Kerala. A mural is any piece of artwork painted or applied directly on a wall, ceiling or other large permanent surface. In the contemporary scenario Mural painting is not restricted to the permanent structures and are being done even on canvas. Kerala mural paintings are the frescos depicting mythology and legends, which are drawn on the walls of temples and churches in South India, principally in Kerala. Ancient temples, churches and places in Kerala, South India, display an abounding tradition of mural paintings mostly dating back between the 9th to 12th centuries when this
form of art enjoyed Royal patronage. Learning Mural painting through the theory and practice workshop is the objective of this course.

Course on Organic Farming and Sustainability
Organic farming is emerging as an important segment of human sustainability and healthy life. Haritamritam is an attempt to empower the youth with basic skills in tradition of organic farming and to revive the culture of growing vegetables that one consumes, without using chemicals and pesticides. Growth of Agriculture through such positive initiatives will go a long way in nation development. In Amma’s words “it is a big step in restoring the lost harmony of nature”.

Benefits of Indian Medicinal Systems
Indian medicinal systems are one of the most ancient in the world. Even today society continues to derive enormous benefits from the wealth of knowledge in Ayurveda of which is recognised as a viable and sustainable medicinal tradition. This course will expose students to the fundamental principles and philosophy of Ayurveda and other Indian medicinal traditions.

Traditional Fine Arts of India
India is home to one of the most diverse Art forms world over. The underlying philosophy of Indian life is “Unity in Diversity” and it has led to the most diverse expressions of culture in India. Most art forms of India are an expression of devotion by the devotee towards the Lord and its influence in Indian life is very pervasive. This course will introduce students to the deeper philosophical basis of Indian Art forms and attempt to provide a practical demonstration of the continuing relevance of the Art.

Science of Worship in India
Indian mode of worship is unique among the world civilisations. Nowhere in the world has the philosophical idea of reverence and worshipfulness for everything in this universe found universal acceptance as it in India. Indian religious life even today is a practical demonstration of the potential for realisation of this profound truth. To see the all-pervading consciousness in everything, including animate and inanimate, and constituting society to realise this truth can be seen as the epitome of civilizational excellence. This course will discuss the principles and rationale behind different modes of worship prevalent in India.

15CHY100 CHEMISTRY 3 0 0 3

Unit 1
Chemical Bonding
Review of orbital concept and electronic configuration, electrovalency and ionic bond formation, ionic compounds and their properties, lattice energy, solvation enthalpy and solubility of ionic compounds, covalent bond, covalency, orbital theory of covalency - sigma and pi bonds - formation of covalent compounds and their properties. Hybridization and geometry of covalent molecules - VSEPR theory - polar and non-polar covalent bonds, polarization of covalent bond - polarizing power, polarisability of ions and Fajan’s rule, dipole moment, percentage ionic character from dipole moment, dipole moment and structure of molecules - co-ordinate covalent compounds and their characteristics, molecular orbital theory for H2, N2, O2 and CO, metallic bond - free electron, valence bond and band theories, weak chemical bonds – inter and intra molecular hydrogen bond - van der Waals forces.

Unit 2
Thermodynamic Parameters
Stoichiometry - mole concept, significance of balanced chemical equation - simple calculations - Conditions for occurrence of chemical reactions - enthalpy, entropy and free changes - spontaneity – Thermochemistry - heats of reactions - (formation, combustion, neutralization) - specific heats - variation of enthalpy change with temperature - Kirchhoff’s relation (integrated form) - bond enthalpy and bond order - Problems based on the above.

Kinetics
Review of molecularity and order of a reaction, rate law expression and rate constant - first, second, third and zero order reactions, pseudo-first order reactions (pseudo-unimolecular reactions) - complex reactions - mechanism of these reactions - effect of temperature on reaction rates - Arrhenius equation and its significance, Michaelis Menden kinetics-enzyme catalysis.

Unit 3
Electrochemistry
Electrolytes - strong and weak, dilution law, Debye-Huckel theory, faraday’s laws, origin of potential, single electrode potential, electrochemical series, electrochemical cells, Nernst equation and its application, reference electrodes- SHE, Ag/AgCl, Calomel.

Photochemistry
Photochemistry, laws of photochemistry - Stark-Einstein law, Beer-Lamberts law, quantum efficiency-determination, photochemical processes - Jablonsky diagram, internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo sensitization, photo polymerization.
### CHEMISTRY LAB.

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<td>15CHY181</td>
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1. Acid base titration (double titration)
2. Complexometric titration (double titration)
3. Redox (permanganometry) titration (double titration)
4. Conductometric titration
5. Potentiometric titration
6. Ester hydrolysis

### ADVANCED POLYMER CHEMISTRY

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<td>15CHY231</td>
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</table>

#### Unit 1

#### Unit 2
Solid-state irradiation polymerization - Atom transfer radical polymerization - Plasma Polymerization - Zwitterionic Polymerization - Isomerization polymerization - Polymer supported solid phase reactions - Merrifield method.

Polymer degradation and stabilization: Mechanism of different types of degradation - Commonly used antidegradants and the mechanism of their stabilization.

#### Unit 3

### BIOMATERIALS SCIENCE

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#### Unit 1
Introduction: Bulk properties, Surface properties and characterization - polymers, silicone biomaterials, medical fibres and biotextiles - Smart polymers - biodegradable and biodegradable materials - natural materials, metals and ceramics - physicochemical surface modification.

Biocompatibility concepts: Introduction to biocompatibility - cell material interaction - types of materials - toxic, inert, bioactive - long term effects of materials within the body - cell response.

#### Unit 2
Chemical and biochemical degradation of polymers - degradation of metals and ceramics - calcification of biomaterials.

Host reactions and their evaluation: Inflammation and foreign body response - adaptive immunity - systemic toxicity and hypersensitivity - blood coagulation and blood materials interactions - device related infections.

#### Unit 3
Biological testing of biomaterials: Invitro and invivo assessment of tissue compatibility - evaluation of blood materials interaction - microscopy in biomaterials.

Practical aspects of biomaterials: Bioelectrodes, biomedical sensors and biosensors - sterilization of implants - implant failure - implant retrieval and evaluation - legal aspects, ethical issues and regulation aspects.

### TEXTBOOK:


### REFERENCES:

15CHY233  CATALYTIC CHEMISTRY  3 0 0 3

Unit 1
Catalysis: Introduction, Industrial applications. Rates of reactions - equilibrium, energy of activation and the catalyst’s role, Elementary reactions in catalytic transformations homogeneous and heterogeneous catalysis.

Catalysis in solutions: Acid-base catalysis - catalysis in the gas phase, catalysis in dilute aqueous solution, catalysis in concentrated strong acid solutions, catalysis by bases, catalysis by metal ions, catalysis by electron transfer, organometallic catalysis, catalysis in Ziegler Natta/Metallocene/Metathesis polymerization.

Unit 2
Catalysis by macromolecules, Phase transfer catalysis.

Catalysis by Enzymes: Introduction - kinetics of enzyme catalyzed reaction, catalysis through enzyme, organic catalysis, metalloenzyme catalysis, supported enzymes. Industrial applications of enzyme catalyst.

Catalysis by Polymers: Attachment of catalytic groups to polymer supports, Adsorption and the Kinetics of polymer-catalyzed reactions.

Unit 3
Catalysis in polymer gels, bifunctional and multifunctional catalysis, porous polymers, Applications of polymer catalysis.


TEXTBOOKS:

REFERENCES:

15CHY234  CHEMISTRY OF ADVANCED MATERIALS  3 0 0 3

Unit 1
Chemistry of Engineering Plastics: Preparation, properties and applications of ABS, polycarbonates, epoxy resins - polyamides - Nylon and Kevlar.


Unit 2

Unit 3
Functional electro active polymers: Conjugated polymers - synthesis, processing and doping of conjugated polymers: polycetylene, polyaniline, polythiophene, poly (p-phenylenevinylene) -  ionically conducting polymers - applications of conjugated polymers. Semi-conducting, poly ferrocene - photo resist optical fibers and sensors, photo chomic & thermo chomic materials.


High energy materials: Preparation, properties and application of ammonium nitrate (AN), NH4NO3, ammonium perchlorate (AP), NH4ClO4, ammonium dinitramide (AND), NH4N(NO2)2, hydrazinium nitroformate (HNF), N2H5C(NO2)3 etc.

TEXTBOOKS:

REFERENCES:


Unit 2

Chemistry of Engineering Plastics: Preparation, properties and applications of ABS, Polycarbonates, Epoxy resins - Polyamides - Nylon and Kevlar.

Photochemistry in Electronics: Photochemical reactions - laws of absorption (Grothers-Draper law - Stark-Einstein's law) - Quantum efficiency - photochemical decomposition of HI and HBr - and Quantum yield.

Unit 3
Florescence and Phosphorescence - chemiluminescence - photo sensitization.

Chemistry of Toxic Materials and Toxicology: Principles of Toxicology - Volatile poisons - Gases CO, hydrocyanic acid - H2S - PH3 - CO2 - SOx - NOx - Heavy metals - lead, arsenic, mercury, antimony, bismuth, selenium, zinc, thallium - Pesticides - Food poisoning - Drug poisoning - barbiturates - narcotics - ergot - LSD - alkaloids - Radioactive Toxicology - Radiation hazards.

TEXTBOOK:

REFERENCE:

15CHY236 CHEMISTRY OF NANOMATERIALS 3 0 0 3

Unit 1
Introduction: Introduction to Nanomaterials: Size dependence of properties - Surface to volume ratio and Quantum confinement. Microscopic techniques to study nano structures - SEM, AFM - TEM and STM - Raman spectroscopy.
SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

15CHY237 CHEMISTRY OF TOXICOLOGY 3 0 0 3

Unit 1
Introduction to Toxicology: Definition - scope - history - relationship to other sciences - dose-response relationship - sources of toxic compounds - Classes of Toxicants - broad overview of toxicant classes such as metals, agricultural chemicals, food additives - contaminants, toxins, solvents, drugs, and cosmetics - history, exposure route, and toxicity of the non-essential metals - cadmium, lead, and mercury - medical treatment of metal poisoning - classes of agricultural chemicals - Toxins - source, including microbial, fungal, algal, plant and animal - examples - Brief discussions - food additives and contaminants – solvents - therapeutic drugs - drugs of abuse - combustion products - cosmetics.

Unit 2
Exposure Classes, Toxicants in Air, Water, Soil, Domestic and Settings: Occupational Air, water and soil as primary media for human exposure to various classes of chemical toxicants in environmental, domestic, and occupational settings - historic and present status of air pollution and air quality - introduction to the major classes of soil and water pollutants - sources, exposure routes and potential adverse health effects - Classes of occupational toxicants - route of exposure and permissible levels - specific examples of concern.

Unit 3
Toxicant Analysis and Quality Assurance Principles: Introduction to procedures, principles and operation of analytical laboratories in toxicology. Summary of the general policies - analytical laboratory operation, analytical measurement systems, quality assurance (QA) - quality control (QC) procedures.

Environmental Risk Assessment: Environmental risk assessment procedures - particular environmental risk problem - appropriate endpoints - development of conceptual models, analyzing exposure - effects, information - characterizing exposure - ecological effects - management of risks.


TEXTBOOK:

REFERENCES:

SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

15CHY238 COLLOIDAL AND INTERFACIAL CHEMISTRY 3 0 0 3

Unit 1
Introduction to surfaces, interfaces and colloids: Molecular origin, Surface phenomena and structure of interfaces, Surfactants structure, colloids in action - shapes and size distribution, Types of interaction forces - Physical and Chemical Interaction, Classification of physical forces - Vander Waals force, electrostatic forces.


Unit 2
Interfaces between Condensed Phases - Wetting, The interfaces between condensed phases in two-component systems, Adsorption at interfaces between condensed phases.

Thermodynamics - Adsorption, energy consideration of physical adsorption vs chemisorptions, Gibbs adsorption equation, Langmuir isotherm, BET isotherm, adsorption at solid-liquid interfaces. Emulsions - formation and stability, HLB number, PIT (Phase Inversion Temperature) foams, aerosols, Microemulsions, vesicles, micelles and membranes - applications of various colloidal systems.

Unit 3
Characterization of Colloids, Rheological properties - Classification, Interfacial rheology, Interfacial tension, Electrochemistry of interfaces - Electric double layer.

Stability of charge stabilized colloids, DLVO theory, Hamaker constant, Boltzmann distribution, Debye length, specific ion adsorption, Stern layer, electrostatic, steric and electrosteric stabilization, zeta potential, surface tension, wetting and spreading, contact angle - Young’s modulus, practical application - solid surfaces - surface mobility, characteristics and formation.

TEXTBOOKS:

REFERENCES:
SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

2. J. W. Goodwin, “Colloids and Interfaces with Surfactants and Polymers”, John-Wiley and Sons Ltd, 2004

15CHY239 COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING

Unit 1
Introduction: Stability, symmetry, homogeneity and quantization as the requirements of natural changes - Born - Haber cycle – Energetic – kinetics - Principles of spectra.

Computational techniques: Introduction to molecular descriptors, computational chemistry problems involving iterative methods, matrix algebra, Curve fitting.


Introduction to Quantum mechanics - Schrodinger equation - Position and momentum - MO formation - Operators and the Hamiltonian operator - The quantum oscillator - Oscillator Eigen value problems - Quantum numbers - labeling of atomic electrons.

Unit 2
Molecular Symmetry: Elements of symmetry - Point groups - Determination of point groups of molecules.

Huckel’s MO theory: Approximate and exact solution of Schrodinger equation - Expectation value of energy - Huckel’s theory and the LCAO approximation - Homogeneous simultaneous equations - Secular matrix - Jacobi method - Eigen vectors: Matrix as operator - Huckel’s coefficient matrix - Wheeland’s method - Hoffmann’s EHT method - Chemical applications such as bond length, bond energy, charge density, dipole moment, Resonance energy.

Unit 3
Self consistent fields: Elements of secular matrix - Variational calculations - Semi empirical methods - PPP self consistent field calculation - Slater determinants - Hartree equation - Fock equation – Roothaan - Hall equation - Semi empirical models and approximations.

Ab-initio calculations: Gaussian implementations – Gamess - Thermodynamic functions - Koopman’s theorem - Isodesmic reactions, DFT for larger molecules.

SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

Computer aided assignments/mini projects with softwares - Introduction to HPC in Chemical calculations.

Molecular modelling software engineering - Modeling of molecules and processes - Signals and signal processing in Chemistry - QSAR studies and generation of molecular descriptors - Applications of chemical data mining - Familiarization with open source softwares useful for molecular modeling - Introduction to molecular simulation - M.D. simulation.

TEXTBOOKS:

REFERENCES:

15CHY241 ELECTROCHEMICAL ENERGY SYSTEMS AND PROCESSES

Unit 1
Background Theory: Origin of potential - electrical double layer - reversible electrode potential - standard hydrogen electrode - emf series - measurement of potential - reference electrodes (calomel and silver/silver chloride) indicator and ion selective electrodes - Nernst equation - irreversible processes - kinetic treatment - Butler-Volmer equation - Overpotential, activation, concentration and IR overpotential - its practical significance - Tafel equation and Tafel plots - exchange current density and transfer coefficients.

Unit 2
Batteries: Primary batteries: The chemistry, fabrication and performance aspects, packing classification and rating of the following batteries; (The materials taken their function and significance, reactions with equations, their performance in terms of discharge, capacity, and energy density to be dealt with). Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air, zinc-silver oxide batteries; lithium-ferrous sulphide cells (comparative account).
Secondary batteries: ARM (alkaline rechargeable manganese) cells, Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultra thin lithium polymer cells (comparative account). Advanced Batteries for electric vehicles, requirements of the battery - sodium-beta and redox batteries.

Unit 3

Electrochemical Processes: Principle, process description, operating conditions, process sequence and applications of Electroforming – production of waveguide and plated through hole (PTH) printed circuit boards by electrodeposition; Electroless plating of nickel, copper and gold; Electropolishing of metals; Anodizing of aluminium; Electrochemical machining of metals and alloys.

TEXTBOOKS:

REFERENCES:

SYLLABI
B. Tech - Civil Engg. 2015 admissions onwards


Unit 2
Aerobic processes - wastewater treatment systems (brief description only) - anaerobic and aerobic - sewage treatment - primary, secondary and tertiary processes - water reuse and recycle. Eutrophication of lakes, nitrogen and phosphorus in effluents - Drinking water standards - sources - fluoride and arsenic in water, purification, sterilization - chemistry of chlorination - water purification for domestic use - reverse osmosis - nano filters and membranes.

Industrial Pollution and its control: Industrial pollution and waste waters from various types of industries - environmental pollution due to paper mills, textile mills etc., and its control. Solid waste disposal - methods - solid waste from mining and metal production and its disposal - Electrochemical treatment of pollution control, electro-coagulation and flocculation - Green chemical processes and green solvents - reaction conditions to control industrial pollution.

Unit 3
Other types of pollution: Soil pollution - agricultural pollution - use of chemical fertilizers - Organic chemicals and environment, dioxins and furans - chemistry of some of the pesticides, insecticides and herbicides, ill effects due to uncontrolled use - Bulk storage of hazardous chemicals and disasters, Radioactive pollution, radiation units, sources - exposure and damage - safety standards - radioactive wastes and their disposal - Toxicological substances, testing of toxic substance, enzyme inhibition and biochemical effects of toxic chemicals on humans.

Sampling and Measurements of Pollutants: Sampling and analysis techniques of air pollutants (brief outline only) - analysis of particulate matter and lead - Sampling and measurements of water pollutants - organic loadings, phosphates and nitrogen compounds - monitoring of water quality - water test kits, various analytical methods (brief outline only).

TEXTBOOKS:
REFERENCES:

15CHY243  FUELS AND COMBUSTION  3 0 0 3

Unit 1
Fuels - Solid fuels - Classification, preparation, cleaning, analysis, ranking and properties - action of heat, oxidation, hydrogenation, carbonization, liquefaction and gasification.

Liquid fuels – Petroleum - origin, production, composition, classification, petroleum processing, properties, testing - flow test, smoke points, storage and handling.


Unit 2
Gaseous fuels - Types, natural gas, methane from coal mine, water gas, carrier gas, producer gas, flare gas, blast furnace gas, biomass gas, refinery gas, LPG - manufacture, cleaning, purification and analysis. Fuels for spark ignition engines, knocking and octane number, anti knock additives, fuels for compression engines, octane number, fuels for jet engines and rockets.

Flue gas analysis by chromatography and sensor techniques.

Unit 3

Rocket propellants and Explosives - classification, brief methods of preparation, characteristics; storage and handling.

SYLLABI
B. Tech - Civil Engg.  2015 admissions onwards

REFERENCES:

15CHY244  GREEN CHEMISTRY AND TECHNOLOGY  3 0 0 3

Unit 1
Our environment and its protection, chemical pollution and environmental regulations, environmental chemistry, pollution prevention strategies, challenges to the sustainability of chemical industry, Pollution Prevention Act 1990, USA, Green Chemistry and its 12 principles, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, alternative solvents, energy minimization, microwave and sonochemical reactions, renewable feed stock, carbon dioxide as a feed stock.

Unit 2
Greener strategies of the synthesis of ibuprofen synthesis, teripiphhalic acid etc. phase behaviour and solvent attributes of supercritical CO2, use of supercritical carbon dioxide as a medium chemical industry, use of ionic liquids as a synthetic medium, gas expanded solvents, superheated water, etc. Synthesis of various chemicals from bio mass, polycarbonate synthesis and CO2 fixation, green plastics, green oxidations, etc.

Unit 3
Processes involving solid catalysts – zeolites, ion exchange resins, Nafion/silica nano composites and enhanced activity. Polymer supported reagents, green oxidations using TAML catalyst, membrane reactors. Green chemistry in material science, synthesis of porous polymers, green nanotechnology.

REFERENCES:
1. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blackwell Publishing.
Unit 1

Separation Techniques: Brief outline of column, paper and thin layer chromatography - Ion exchange methods - principle and application – HPLC.

Unit 2
Gas chromatography - principle and applications – gel chromatography.


Unit 3

Thermal and Diffraction techniques: Principles and applications of DTG - DTA - DSC - X-ray - Electron Diffraction Studies - SEM, TEM.

TEXTBOOKS:

REFERENCES:
Unit 2

Unit 3
Composite precursors: SMCs, DMCs, BMCs prepreg materials and their choice in specific applications. Fabrication processes for FRP Composites: hand layup, spray up, vacuum bag moulding, compression moulding, filament winding, braiding, pultrusion, RTM, RIM, RRIM, RFI, autoclave moulding, injection moulding etc. Room temperature and hot curing of composites, Nanocomposites: Introduction; Nanoscale Fillers – Clay, POSS, CNT, nanoparticle fillers; Processing into nanocomposites; Modification of interfaces; Properties. Applications. Joining composite elements and repairs, Recycling of polymer composites.

TEXTBOOKS:

REFERENCES

Organic Reaction Mechanisms

Unit 1
Introduction to organic chemistry: Lewis structure and formal charges of organic compounds - electro negativities and dipoles, resonances, aromaticity and anti aromaticity - equilibrium, tautomerism and hyper conjugation - acidity and basicity - pKa, nucleophiles and electrophiles - hydrogen bonding - different types of organic reaction - addition, substitution, elimination and rearrangement - oxidations and reductions - general principles of writing organic reaction mechanism - reactive intermediates.

Reaction of nucleophiles and bases: Nucleophilic substitution - SN1 and SN2 reactions, nucleophilic substitution at aliphatic sp2 carbon and aromatic carbon - nucleophilic addition to carbonyl compounds - addition of grignard and organo lithium reagents - reactions of nitrogen containing nucleophiles with aldehyde and ketones - aldol condensation.

Unit 2
Michael and 1,4-addition reaction - Favorisk rearrangement - benzilic acid rearrangement - reaction mechanism in basic media - Mannich reaction - enols and enolates.

Reaction involving acids and other eletrophiles: Carbocations - formation and rearrangements - cationic rearrangement involving electron deficient nitrogen atom - Beckmann rearrangement - Curtius, Lossen and Schmidt rearrangement - electrophilic additions - acid catalyzed reaction of carbonyl compounds - hydrolysis of carbocyclic acid derivatives - electrophilic aromatic substitution - carbones and benzynes - Baeyer-Villeger reactions - Dienone-phenol rearrangement - pinacol rearrangement.

Unit 3
Radical and radical ions: Formation of radicals, radical chain processes, radical addition, reaction with and without cyclisation - fragmentation reaction - rearrangement of radicals - SRN 1 reaction - radical ions - Birch reduction - Hofmann-Loffler-Freytag reaction - Barton reaction - McMurry reaction.


TEXTBOOK:

REFERENCES:

Organic Synthesis and Stereochemistry

Unit 1
Nomenclature of Organic compounds: Polenes, Alkynes with and without functional groups by IUPAC nomenclature. Aromatic and Heteroaromatic systems - nomenclature of heterocycles having not more than two hetero atoms such as oxygen, sulphur, nitrogen.
STEREOCHEMISTRY

Tactility, R/S system of nomenclature of central and axial molecules.

Unit 2

Atropisomerism - isomerism of biphenyls - allenes and spiranes - ansa compounds - Geometrical isomerism, E, Z Isomerism. Asymmetric synthesis.

Conformational Analysis: Optical activity and chirality - Conformational Analysis of cyclic and acyclic system - Conformational effects on reactivity of acyclic systems only.

Unit 3


TEXTBOOKS:

REFERENCES:

POLYMER MATERIALS AND PROPERTIES

Unit 1


Unit 2

Manufacturing, mechanical, thermal, electrical and chemical properties and applications of commodity plastics - PE, PP, PVC, PS, Engineering plastics - ABS, PC, PMMA, polyamide, polycetal, PET, PBT, PTFE. High performance polymer - PES, PFI, PEEK; conducting polymer.

Unit 3

Thermoset materials - PF, UF, MF, epoxy and unsaturated polyester resin, Rubber - natural rubber, synthetic rubber - SBR, PB, nitrile, chloroprene, butyl, silicone - compounding and additives.

TEXTBOOKS:

REFERENCES:
SOLID STATE CHEMISTRY

Unit 1

Unit 2
Electrical and Magnetic Properties: Development of free electron theory to band theory of solids - metals and their properties; semiconductors - extrinsic and intrinsic, Hall effect; Insulators - dielectric, ferroelectric, pyroelectric and piezoelectric properties and the relationship between them. Dia, para, ferro, ferri, antiferro and antiferri magnetic types - selected magnetic materials such as spinels, garnets and perovskites, superconductors.


Unit 3

Fourier synthesis - definition, applications of fourier synthesis in crystal structure analysis of S-Tetrazine. Structure of Rutile, Fluorite, Antifluorite, Zinc blende, Wurtzite, diamond and graphite.

REFERENCES:
SYLLABI
B. Tech - Civil Engg. 2015 admissions onwards

TEXTBOOKS:

REFERENCES:

15CHY332 CORROSION SCIENCE 3 0 0 3

Unit 1
Basic principles: Free energy concept of corrosion - different forms of corrosion - Thermodynamic & Kinetic aspects of corrosion: The free energy criterion of corrosion possibility - Mechanism of Electrochemical corrosion - Galvanic and Electrochemical series and their significance.

Corrosion Control: Materials selection - metals and alloys - metal purification - non metallic - changing medium.

Unit 2
Anodic and cathodic protection methods - Coatings - metallic and other inorganic coatings - organic coatings - stray current corrosion - cost of corrosion control methods.

Corrosion protection by surface treatment: CVD and PVD processes - Arc spray - Plasma spray - Flame spray.

Corrosion Inhibitors: Passivators - Vapour phase inhibitor.

Unit 3
Stress and fatigue corrosion at the design and in service condition - control of bacterial corrosion.


TEXTBOOKS:

SYLLABI
B. Tech - Civil Engg. 2015 admissions onwards

REFERENCES:

15CSE100 COMPUTATIONAL THINKING AND PROBLEM SOLVING 3 0 2 4

Unit 1

Unit 2

Unit 3
Problem Solving Techniques: Factoring and Recursion Techniques, Search and Sort techniques, Text processing and Pattern matching.

TEXTBOOKS:
2. R. G. Dromey, “How to solve it by Computer”, PHI, 2008

15CSE102 COMPUTER PROGRAMMING 3 0 0 3

Unit 1
Introduction to C language: Structure of a C program, comments, Data types, Variables, constants, Data input and output statements, input assertions; expressions and evaluation. Functions: inter function communication, standard functions, scope. Selection: two way selection, multi-way selection, repetition: concept of loop, loop invariant, pretest and post-test loops, initialization and updating, event and counter controlled loops. Recursion: recursive definition, recursive solution, designing recursive functions, limitations of recursion.

Unit 2
Unit 3

Strings: fixed length and variable length strings, strings and characters, string input output, array of strings, string manipulation functions, sorting of strings. Enumerated types, Structures: Structure vs array comparison, complex structures, Structures and functions, Union, binary input output, Command line arguments.

TEXTBOOK:

REFERENCES:

15CSE180 COMPUTER PROGRAMMING LAB. 0 0 2 1

Solving simple problems with operators, programs on conditional control constructs, programs on loops (while, do-while, for), programs using user defined functions and library functions, programs on Files, arrays, matrices (single and multi-dimensional arrays), programs using DMA, programs on strings, structures.

REFERENCE:

15CUL101 CULTURAL EDUCATION I 2 0 0 2

Unit 1
Introduction to Indian Culture; Introduction to Amma’s Life and Teachings; Symbols of Indian Culture.

Unit 2
Science and Technology in ancient India; Education in Ancient India; Goals of Life - Purusharthas; Introduction to Vendanta and Bhagavat Gita.

Unit 3
Introduction to Yoga; Nature and Indian Culture; Values from Indian History; Life and work of Great Seers of India.

TEXTBOOKS:
1. The Glory of India (in-house publication)
2. The Mother of Sweet Bliss (Amma’s Life & Teachings)

15CUL111 CULTURAL EDUCATION II 2 0 0 2

Unit 1
1. Relevance of Sri Rama and Sri Krishna in this Scientific Age
2. Lessons from the Epics of India
3. Ramayana & Mahabharata

Unit 2
4. Who is a Wise Man?
5. A Ruler’s Dharma
6. The Story of King Shibi

Unit 3
7. Introduction to the Bhagavad Gita
8. Bhagavad Gita – Action without Desire

Unit 4
9. Role and Position of Women in India
10. The Awakening of Universal Motherhood

Unit 5
11. Patanjali’s Astanga-Yoga System for Personality Refinement
12. Examples of Heroism and Patriotism in Modern India

TEXTBOOKS:
Common Resource Material II (in-house publication)
Sanatana Dharma - The Eternal Truth (A compilation of Amma’s teachings on Indian Culture)

15CUL230 ACHIEVING EXCELLENCE IN LIFE - AN INDIAN PERSPECTIVE 2 0 0 2

OBJECTIVES: The course offers to explore the seminal thoughts that influenced the Indian Mind on the study of human possibilities for manifesting excellence in life. This course presents to the students, an opportunity to study the Indian perspective of Personality Enrichment through pragmatic approach of self analysis and application.
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Unit 1
Goals of Life – Purusharthas
What are Purusharthas (Dharma, Artha, Kama, Moksha); Their relevance to Personal life; Family life; Social life & Professional life; Followed by a Goal setting workshop;

Yogic way of Achieving Life Goals – (Stress Free & Focused Life) Introduction to Yoga and main schools of Yoga; Yogic style of Life & Time Management (Work Shop);

Experiencing life through its Various Stages
Ashrama Dharma; Attitude towards life through its various stages (Teachings of Amma);

Unit 2
Personality Development
What is Personality – Five Dimensions – Pancha Kosas (Physical / Energy / Mental / Intellectual / Bliss); Stress Management & Personality; Self Control & personality; Fundamental Indian Values & Personality;

Learning Skills (Teachings of Amma)
Art of Relaxed Learning; Art of Listening; Developing ‘Shraddha’ – a basic qualification for obtaining Knowledge;

Communication Skills - An Indian Perspective;

Unit 3
Developing Positive Attitude & Friendliness - (Vedic Perspective);

Achieving Work Excellence (Karma Yoga by Swami Vivekananda & teachings based on Amma);

Leadership Qualities – (A few Indian Role models & Indian Philosophy of Leadership);

REFERENCE BOOKS:
1. Awaken Children (Dialogues with Sri Mata Amritanandamayi) Volumes 1 to 9
2. Complete works of Swami Vivekananda (Volumes 1 to 9)
3. Mahabharata by M. N Dutt published by Parimal publications – New Delhi (Volumes 1 to 9)
4. Universal message of Bhagavad-Gita (An exposition of Gita in the light of modern thought and Modern needs) by Swami Ranganathananda. (Vols.1 to 3)

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B. Tech - Civil Engg. 2015 admissions onwards

15CUL232 EXPLORING SCIENCE AND TECHNOLOGY 2 0 0 2
IN ANCIENT INDIA

OBJECTIVES: This course offers a journey of exploration through the early developments in India of astronomy, mathematics, technologies and perspectives of the physical world. With the help of many case studies, the students will be equipped to understand concepts as well as actual techniques.

Unit 1
1. General introduction: principles followed and sources;
2. Astronomy & mathematics from the Neolithic to the Indus civilization;
3. Astronomy & mathematics in Vedic literature;
4. Vedanga Jyotisha and the first Indian calendars;
5. Shulba Sutras and the foundations of Indian geometry;

Unit 2
6. Astronomy & mathematics in Jain and Buddhist literature;
7. The transition to the Siddhantic period; Aryabhata and his time;
8. The Aryabhatiya: concepts, content, commentaries;
9. Brahmagupta and his advances;
10. Other great Siddhantic savants;
11. Bhaskara II and his advances;

Unit 3
12. The Kerala school of mathematics;
13. The Kerala school of astronomy;
14. Did Indian science die out?;
15. Overview of recent Indian scientists, from S. Ramanujan onward;
16. Conclusion: assessment and discussion;

TEXTBOOK:
Indian Mathematics and Astronomy: Some Landmarks, by S. Balachandra Rao

REFERENCE:
IFIH’s interactive multimedia DVD on Science & Technology in Ancient India.

15CUL233 YOGA PSYCHOLOGY 2 0 0 2

OBJECTIVES: This course offers the foundation necessary to understand Eastern approaches to psychology and spirituality. The course includes experiential components centering on meditation and spiritual practice.

Unit 1
Introduction
Introduction to Modern Psychology
A short history of Modern Psychology - Major Schools of Modern Psychology - The three major forces in Western Psychology - Freudian Psychoanalysis; Behaviourism; Humanistic Psychology.

Introduction to Indian Psychology
What is Yoga? - Rise of Yoga Psychology tradition - Various schools of Yoga Psychology - Universal Goal of all Yoga-schools.

Patanjali Yoga Sutra – 1

Patanjali Yoga Sutra – 2

Unit 2
Patanjali Yoga Sutra – 3
Two formulae - Necessity of Abhyasah and Vairagyah - Foundation of Abhyasah - Foundation of Vairagyah.

Patanjali Yoga Sutra – 4

Patanjali Yoga Sutra – 5
Main obstacles in the path of Yoga - other obstructions - removal of obstacles by one – pointedness; by controlling Prana - by observing sense experience - by inner illumination - by detachment from matter - by knowledge of dream and sleep - by meditation as desired.

Patanjali Yoga Sutra – 6

Patanjali Yoga Sutra – 7
Unit 3
Patanjali Yoga Sutra – 8

Patanjali Yoga Sutra – 9

Patanjali Yoga Sutra – 10
Asanam – Pranayamah - various kinds of Pranayamah - Pratyaharah - Mastery over the senses.

Report review
Conclusion

REFERENCES:
- The course book will be “The four chapters of Freedom” written by Swami Satyananda Saraswat of Bihar School of Yoga, Munger, India.
- “The message of Upanishads” written by Swami Ranganathananda. Published by Bharathiya Vidya Bhavan.
- Eight Upanishads with the commentary of Sankaracharya, Translated by Swami Gambhirananda, Published by Advaita Ashram, Uttaranal.
- ‘Hatha Yoga Pradipika’ Swami Muktibodhananda, Yoga Publications Trust, Munger, Bihar, India

15CVL102 MECHANICS: STATICS AND DYNAMICS 2 1 0 3

Unit 1

Statics of rigid bodies in two dimensions and three dimensions: Moment of a force about a point – moment of a force about an axis – moment of a couple – equivalent force couple system – rigid body equilibrium – support reactions.

Unit 2

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TEXTBOOKS:

REFERENCE BOOKS:

15CVL201 CONSTRUCTION MATERIALS  3 0 0 3

Unit 1
Commonly used building materials - relationship between material structure and properties.

Masonry materials - stones, bricks, blocks; Refractory products; Timber and wood based products - Classification, properties, testing and selection criteria.


Unit 3


TEXTBOOKS:

REFERENCE BOOKS:

15CVL202 PINCIPLES OF FLUID MECHANICS  2 1 0 3

Unit 1
Elementary concepts – properties - concept of gauge and absolute pressure, measurement of pressure using manometers of different types.

Hydrostatic force on plane and curved surface – center of pressure – lock gates - buoyancy and stability of submerged and floating bodies - metacentric height - period of oscillation.

Types of flow, definitions and explanations of unsteady, steady, non-uniform, laminar and turbulent flows. Ideal flow - rotational and irrotational, stream function, potential function. Path line, streak line and stream line – continuity equation – derivation, application of one dimensional steady flow – circulation and vorticity - Basic flow fields such as uniform flow, source, sink, doublet, vortex flow, spiral flow – superposed flows.

Unit 2
Derivation of Bernoulli’s energy equation and Euler’s equation, examples illustrating the use of energy equation. Flow meters - venturimeter, Orifice meter, nozzle, derivation of equations of discharge, pitot tubes – applications to flow measurements - notches and weirs.

Laminar flow through circular pipe – shear stress, pressure gradient, velocity profile, Hagen-poiseuille’s equation, power calculations, laminar flow between parallel plates - Couette flow and Poiseuille flow.


Unit 3
Boundary layer theory, boundary layer equation – Prandtl equation, Blasius solution, drags on flat plate, boundary layer separation and its control.

Dimensional Analysis, Similitude and Model Analysis: Methods of Dimensional Analysis – Rayleigh’s method – Buckingham Pi-theorem – Hydraulic Similitude –
model analysis – dimensionless numbers – Model testing of partially submerged bodies – Distorted models and scale effects.

**TEXTBOOKS:**

**REFERENCE BOOKS:**

**15CVL203 SOLID MECHANICS 3 1 0 4**

**Unit 1**
Stress and strain at a point – tension, compression and shear stresses – Hooke’s law - Poisson’s ratio - relationship between elastic constants – compound bars - thermal stresses – strain energy in tension, compression and shear - resilience – stresses due to impact and suddenly applied load.

Different types of beam – statically determinate and indeterminate beams - shear force and bending moment diagrams - relationship between intensity of loading, shear force and bending moment.

**Unit 2**
Theory of simple bending - Stress distribution at a cross-section due to bending moment forstastically determinate beams - flitched beams.

Shear stress distribution.

Unsymmetrical bending and Shear centre.

Torsion of circular solid and hollow shafts – combined bending moment and torsion on shafts – close coiled and open coiled helical springs

Complex stresses – principal stresses and principal planes - principal strains – graphical method.

**15CVL204 SURVEYING 3 1 0 4**

**Unit 1**
Introduction - classification of surveys – reconnaissance - principle of working from whole to part – provision of control – conventional signs


**Unit 2**

Unit 3

Curves – simple, transition and vertical curves - curve setting by various methods.

Tacheometric surveying – various methods – instrument constants – analytic lens – tangential system – direct reading tacheometer - subtense bar – trigonometric leveling. Total station - introduction to photogrammetry, remote sensing, global positioning systems, and Geographic information systems. EDM.

Introduction to Hydrographic surveying.

TEXTBOOKS:

REFERENCE BOOKS:
SYLLABI

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Unit 2


Seepage through soils: Total, neutral and effective stresses – quick sand condition – Seepage through soils – Flow nets: characteristics and uses.

Unit 3
Stress distribution in soils: Boussinesq’s and Westergaard’s theories for point loads and areas of different shapes – Newmark’s influence chart.

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties – Field compaction equipment - compaction control.


TEXTBOOKS:

REFERENCE BOOKS:

15CVL213 HYDRAULIC ENGINEERING 2103

Unit 1
Impulse momentum principle – application – impact of jet-force exerted by a jet on normal, inclined and curved surfaces for stationary and moving cases – torque in rotating machines – jet propulsion.

HYDRAULIC ENGINEERING 2103


Classification of pumps – Centrifugal pumps – types and working – characteristics. Reciprocating pumps - types and working – selection of pumps.

Unit 2
Open channel flow - Comparison with pipe flow, Types of channels - Classification of flow, uniform flow - Uniform flow using chezy’s and Manning’s formulae - Most efficient channel section – Circular, Rectangular and Trapezoidal channel sections, open channel section for constant velocity at all depths of flow. Specific energy and critical depth, Specific force curve, critical flow computation.


Unit 3

TEXTBOOKS:

REFERENCE BOOKS:

15CVL214  STRUCTURAL ANALYSIS  2 1 0 3

Unit 1
Statically indeterminate structures - degree of static and kinematic indeterminacies. Introduction to force and displacement methods of analysis.

Energy principles – Castigliano’s theorems - Engessor’s theorem - Maxwell Betti’s theorem - Principle of least work – Method of virtual work (unit load method) - applications in statically determinate and indeterminate structures.

Analysis of Propped cantilever and fixed beams.

Unit 2
Cables – maximum tension – types of supports – forces in towers – suspension bridges with three and two hinged stiffening girders.

Theory of arches – Eddy’s theorem – analysis of three hinged and two hinged arches – settlement and temperature effects.

Beams curved in plan – analysis of cantilever beam curved in plan – analysis of circular beams over simple supports.

Unit 3
Moving loads and influence lines – influence lines (IL) for statically determinate beams for reaction, SF and BM – effect of moving loads – concentrated and uniformly distributed loads – load position for maximum BM and SF - equivalent UDL.

IL for determinate structures – truss, arch and suspension bridge.

TEXTBOOKS:

REFERENCEBOOKS:

2. Tests on fine aggregate - Grain size distribution – Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Bulking & Absorption
3. Tests on coarse aggregate - Grain size distribution – Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Absorption, Crushing & Impact values, Flakiness & Elongation, Los Angeles’ Abrasion test
4. Test on fresh and hardened concrete
   (a) Workability test - Slump test, Compaction factor test, Flow table test, Vee-Bee Consistometer,
   (b) Use of water reducing admixtures
   (c) Compressive strength, Split tensile strength, Flexure test on beams, Modulus of elasticity
5. Tests on bricks – Crushing strength, water absorption and efflorescence
6. Basic tests on Bitumen.

15CVL286 HYDRAULIC ENGINEERING LAB. 0 0 2 1
2. Verification of Bernoulli’s equation.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of Triangular Notch
6. Determination of friction factor of pipes
7. Impact of jet on vanes
8. Calibration of Venturimeter, Orificemeter, rotameter and watermeter
9. Determination of metacentric height
11. Efficiency test on centrifugal pump and reciprocating pump.
12. Open channel flow: Manning’s coefficient, specific energy curve, Tracing back water profiles/draw down profiles, Hydraulic jump parameters

15CVL301 ADVANCED STRUCTURAL ANALYSIS 2 1 0 3
Unit 1
Slope deflection method – application to the analysis of statically indeterminate beams with and without settlement of supports - rigid jointed plane frames with and without side sway - gable frames.
Analysis of continuous beams - theorem of three moments.
Sway and non-sway analysis by Moment distribution method and Kani’s method.

15CVL302 DESIGN OF CONCRETE STRUCTURES 3 1 0 4
Unit 2

Unit 3

Introduction to FEM.

TEXTBOOKS:

REFERENCE BOOKS:
Unit 3
Introduction to slender columns. Design of isolated footing for axially loaded & eccentrically loaded columns, combined footing. Design of staircases.

Introduction to Prestressed concrete with simple examples.

TEXTBOOKS:

REFERENCE BOOKS:
1. Park and Paulay, "Reinforced Concrete Structures", Wiley India (P) Ltd, 2010
5. BIS Codes (SP 23, SP 24, IS 456, IS 875, IS 10262, IS 800, SP 16, IS 883, IS 2750)

15CVL303 GEOTECHNICAL ENGINEERING 3 1 0 4

Unit 1


Unit 2

Safe bearing pressure based on N-value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures – Settlement Analysis.

Pile Foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

TEXTBOOKS:

REFERENCE BOOKS:

15CVL311 DESIGN OF STEEL STRUCTURES 3 1 0 4

Unit 1
Introduction to structural steel sections, material property, geometric properties, classes of sections, stresses, residual temperature stresses in rolled steel sections, loads. Types of design - rigid, semi rigid. Limit state design method – basic concepts, partial safety factors, load combinations, deflection limitations as per IS:800.

Analysis and design of bolted and welded connections to resist direct force and moment.

Design of tension members - single and double angle ties.

Unit 2
Compression members: Axially and eccentrically loaded compression members - built up columns - lacings and battens - design of column bases.

Analysis and design of laterally restrained & unrestrained simple & compound beams - Design for flexure, shear, deflection, and bearing.

Unit 3

Introduction to cold-formed steel structures (Light gauge steel sections).

TEXTBOOKS:

REFERENCE BOOKS:
Classification of Roads; Highway Planning; Geometrical Design – Road Cross Sections, Sight Distance and Applications, Super elevation, Horizontal and Vertical Alignment.

Unit 2

Unit 3
Traffic engineering and control: Introduction - Road user, vehicle and traffic characteristics - Speed and volume studies - Principles of design of at-grade intersections - Simple layouts - Objectives, classification and uses of traffic signs and road markings. Classification of transport technologies-intermodal co-ordination - ITS and automated highways.

TEXTBOOKS:

REFERENCE BOOKS:

15CVL314 WATER RESOURCES AND IRRIGATION ENGINEERING 3 1 0 4

Unit 1

Unit 2
Reservoir planning - site investigation - zones of storage - Reservoir yield - Estimation of Reservoir Capacity - Reservoir Sedimentation - Reservoir losses and control - Life of Reservoir.

TEXTBOOKS:

REFERENCES:

15CVL381 BUILDING DRAWING 1 0 2 2

Part A
Detailed drawing of components
- Footings
- Roof trusses
- Reinforced Concrete staircase

From given line sketch and specification, develop working drawings of:
- Single storied residential building with flat and tiled roof
- Public buildings like office, dispensary, post office, bank etc.
- Factory building with trusses
Part B (Computer aided drafting)
Preparation of drawings as per building development rules.
• Residential building- flat and pitched roof, economic domestic units, cottages, bungalows
• Public building – small public utility shelters, dispensaries, banks, schools, offices, libraries, hostels, restaurants, commercial complexes, factories etc.
• Preparation of site plans and service plans as per Building Rules.

**TEXTBOOKS:**

**REFERENCE BOOKS:**

**15CVL382 GEOTECHNICAL ENGINEERING LAB.** 0 0 2 1

1. Specific gravity of coarse and fine-grained soils
2. Grain size analysis
3. Atterberg’s limits and indices
4. Determination of field density (a) sand replacement method (b) core cutter method
5. Determination of coefficient of permeability (a) Constant head method: (b) Variable head method
6. Consolidation test
7. Compaction test (a) IS light compaction test (b) IS heavy compaction test
8. California Bearing Ratio test
9. Direct shear test
10. Triaxial shear test
11. Unconfined compressive strength test & Laboratory vane shear test
12. Demonstration of Plate Load & Standard Penetration Tests

**15CVL385 ENVIRONMENTAL ENGINEERING LAB.** 0 0 2 1

1. Determination of solids (total, dissolved, organic, inorganic and settleable) in water
2. Determination of turbidity and the optimum coagulant dose
3. Determination of alkalinity and pH of water

**REFERENCES:**
Standard method for the examination of water and waste water, 2005, APHA, AWWA, WPCF Publication.

**15CVL386 ESTIMATION AND VALUATION PRACTICE** 1 0 2 2

1. Introduction - Types of estimate - plinth area method - cubic rate method - unit rate method - bay method - approximate quantity from bill method - comparison method - cost from materials and labour - preparation of detailed estimate
2. Preparation of detailed estimate using Centre line method
3. Preparation of detailed estimate using Long wall - short wall method
5. Preparation of detailed estimate for Steel Structures.
6. Preparation of detailed estimate for roads
7. Preparation of detailed estimate for sanitary and water supply works
8. Specifications - Detailed specifications for common building materials and items of work as per I.S specifications - Preparation of conveyance statement - Calculation of quantities of materials for items of work - Analysis of rate for items of works required for civil engineering works - Preparation of abstract of estimate of civil engineering works.

**TEXTBOOKS:**

**REFERENCE BOOKS:**
15CVL390 / 15CVL490 LIVE-IN-LAB.  3 cr

This initiative is to provide opportunities for students to get involved in coming up with technology solutions for societal problems. The students shall visit villages or rural sites during the vacations (after 4th semester or sixth semester) and if they identify a worthwhile project, they shall register for a 3-credit Live-in-Lab project, in the fifth or seventh semester. The objectives and projected outcome of the project should be reviewed and approved by the Dept. chairperson and a faculty assigned as the project guide. On completion of the project, the student shall submit a detailed project report. The report shall be evaluated and the students shall appear for a viva-voce test on the project.

15CVL401 CONSTRUCTION MANAGEMENT 3 1 0 4

Unit 1
Construction management environment - Construction activities and sequence.

Construction planning - Network scheduling - Bar chart, linked bar chart, work-breakdown structures, activity-on-arrow diagrams - event based networks. Critical path method. PERT network analysis.

Unit 2


Construction safety and Engineering ethics.

Unit 3
Materials management - inventory control.

Transportation model and application for distribution of materials.

Construction equipment - selection factors - planning of equipment – equipment for excavation, transport, hoisting, piling, and concrete construction.

Introduction to project management softwares.

TEXTBOOKS:
Oxidation / stabilization ponds – aerobic and facultative ponds, Trickling Filters (conventional and high rate).


Unit 3

Solid Waste Management: Solid waste management – causes, effects and control measures of urban and industrial wastes.

Sustainable Development: Sustainable development – Environmental Protection Acts – Introduction to EIA and ISO 14000.

TEXTBOOK:

REFERENCE BOOKS:
**Unit 3**

Design of slab culvert – R.C box culverts – T-beam bridges – Concept on design of continuous bridges, balanced cantilever bridges, arch bridges and rigid frame bridges.

**TEXTBOOKS:**

**REFERENCE BOOKS:**
8. BIS codes (IS 456, IS 2210, IS 4998, IS 3370, SP 16, SP 24, SP 34).
9. IRC Codes (iIRC 5, iIRC 6, iIRC 21)

**15CVL431 ADVANCED MECHANICS OF MATERIALS 2 1 0 3**

**Unit 1**


**Unit 2**

**Unit 3**
Curved Beams: Circumferential stresses - radial stress and shear stress in curved beams - sections having thin flanges - closed sections with thin walls - deflections of sharply curved beams.

Displacements - strains and compatibility - equilibrium equations and boundary conditions – stress field solutions for plane stress problems - polynomial solutions in Cartesian coordinates – displacements calculated from stresses - plane stress problems in polar coordinates.

**TEXTBOOK:**

**REFERENCE BOOKS:**

**15CVL432 ADVANCED STEEL DESIGN 2 1 0 3**

**Unit 1**
Gantry Girder - Design of gantry girder – gantry to column connection.

Water Tanks - Design of rectangular, pressed steel tanks – design of suspended bottom tanks – cylindrical tank with hemispherical bottom – design of staging.

Chimneys - Design of self-supporting chimney – design principles of guyed chimney.


**Unit 2**

Light gauge members – Light gauge sections – design considerations – allowable stresses – buckling, design of compression members, tension members and laterally supported beams – connections.

**Unit 3**
Plate girder bridges - Plate girders – loads – equivalent uniformly distributed loads – Indian railway code of practice – design of plate girder bridges – bearings.
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REFERENCE BOOKS:
9. BIS codes (IS 800, SP 6,IS 804, IS 805, IS 6533, IS 9178, IS 801,IS 811)

15CVL433

BRIDGE ENGINEERING 2 1 0 3

Unit 1

Unit 2
Piers and abutments - function, aesthetics, materials; wing walls - construction aspects. super structure - types - choice of materials - design principles, considerations and criteria of pipe culverts, slab culvert, box culvert, causeways.

Design of T beam and slab bridge - design principles of RC balanced cantilever bridge and articulation. Design concepts of rigid frame bridges - thumb rule design of masonry arch bridges - design of bowstring girder bridge and components.

Unit 3
Suspension bridges, cable stayed bridges and their components; bearings - types - design of rocker and roller bearings.

Bridge superstructure construction - supports and centering for RC bridges - erection of precast RC girders and steel girder bridges - maintenance of bridges, strengthening of masonry arch bridges.

TEXTBOOKS:

SYLLABI

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REFERENCE BOOKS:
4. Relevant Codes of Practice

15CVL434

COMPUTER METHODS OF STRUCTURAL ANALYSIS 2 1 0 3

Unit 1
Force and Displacement measurement - generalized or independent measurements - constrained or dependent measurements - n dimensional space - principle of superposition - methods of structural analysis. Structure with single and two coordinates - flexibility and stiffness matrices in n coordinates – examples - symmetric nature - constrained measurements - stiffness and flexibility matrices of the element as well as the system - computing the influence coefficient.

Strain energy in terms of stiffness and flexibility matrices - interpretation of coefficient - Betti’s law - other energy theorems using matrix notation.

Unit 2
Flexibility and Stiffness Methods (Element Approach): Choice of redundant - ill and well condition equation - Transformation Matrices - transformation of one set redundant to other set - thermal expansion - lack of fit – application to pin-jointed plane truss - continuous beams, frames and grids.

Development of stiffness method - analogy between flexibility and stiffness - analysis due to thermal expansion, lack of fit - Stiffness matrix with rigid body motion - application to pin jointed plane and space trusses - continuous beams - frames and grids - static condensation techniques. Problem solving by computer - choice of the method.

Unit 3

Analysis and Design of Pin-jointed and Rigid-jointed Framed Structures using STADD pro (2D and 3D), Introduction to SAP, ETABS, ABAQUS.

TEXTBOOKS:
REFERENCE BOOKS:

TEXTBOOKS:

REFERENCE BOOKS:

15CVL437 SMART MATERIALS AND STRUCTURES 2 1 0 3

Unit 1
Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.


Unit 2

Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

Unit 3


REFERENCE BOOKS:
REFERENCE BOOKS:
3. IS:1893 - (Part I), Criteria for Earthquake Resistant structures - General Provisions and Buildings
4. IS:13935 – Repair and Seismic strengthening of buildings
5. IS:4326 - Earthquake Resistant Design and Constructions of buildings
6. IS:13920 – Ductile detailing of RC Structures subject to Seismic forces

15CVL440 ADVANCED SURVEYING 2 1 0 3

Unit 1


Unit 3

TEXTBOOKS:

REFERENCE BOOKS:

15CVL441 ARCHITECTURAL SCIENCE 2 1 0 3

Unit 1


Architectural space and mass, visual and emotional effects of geometric forms; activity space and tolerance space. Forms related to materials and structural systems. Architecture as part of the environment.

Unit 2


Design criteria for control of climate – passive and active building design – passive approach. Active systems – low energy cooling.

Unit 3


TEXTBOOKS:

REFERENCE BOOKS:
CONCRETE TECHNOLOGY

15CVL442

Unit 1

Properties of fresh concrete - workability - factors affecting workability - tests for workability - segregation and bleeding.

Unit 2


Unit 3

Introduction to Non-destructive test methods.

TEXTBOOKS:

REFERENCE BOOKS:
15CVL444 DISTRESS MONITORING AND REPAIR OF STRUCTURES

Unit 1
Durability: Life expectancy of different types of buildings – influence of environmental elements such as heat, moisture, precipitation and frost on buildings - Effect of biological agents like fungus, moss, plants, trees, algae - termite control and prevention - chemical attack and impact of pollution on building materials and components - Aspects of fire damage and assessment.

Unit 2

Common defects in buildings and control measures - maintenance philosophy - phases of maintenance.

Materials for repair - special mortar and concretes, concrete chemicals, admixtures, special cements and high grade concrete.

Unit 3

Strengthening measures - flexural strengthening, beam shear capacity strengthening, column strengthening, shoring, under pinning and jacketing.

Conservation of historic buildings - materials and methods - examples.

TEXTBOOKS:

REFERENCE BOOKS:

15CVL445 SUSTAINABLE CONSTRUCTION

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCE BOOKS:

15CVL450 ADVANCED FOUNDATION ENGINEERING

Unit 1
Foundation on expansive soils: Introduction to expansive soil - Clay mineralogy and mechanism of swelling - Identification of expansive soils - Swelling potential, swelling pressure, free swell - Free swell index - Classification of expansive soil - Tests for swell pressure (IS code method) - Prediction of swell pressure from index properties - Damages in buildings on expansive soils - Elimination of swelling - Environmental solutions such as soil replacement techniques and lime columns - Principles of design of foundations in expansive soil deposits - Structural solutions such as provision of rigid foundation, under reamed piles, T Beams as strip footing for walls etc. (basic aspects).

Unit 2
Soil dynamics and Machine foundations: Introduction to soil dynamics - Soil behavior under dynamic loads - Difference between static and dynamic load behavior of soil - Dynamic soil properties - Free vibrations and forced vibrations - Types of machines - Types of machine foundations - Vibration analysis of a machine foundation - General design criteria for machine foundations - Design criteria for foundation for reciprocating machines (IS specifications) - Design procedure for block foundation for a reciprocating machine (IS code method) - Vibration isolation and control.

Unit 3
Special foundations: Introduction to shell foundations - Structural form and efficiency - Different types of shell foundations - General principles of geotechnical design of shell foundations and soil-structure interaction. Special features of the foundations for water tanks, silos, chimneys and transmission line towers.

Foundations for marine structures - Design principles.

TEXTBOOKS:

REFERENCE BOOKS:
Diaphragm walls and coffer dams – type of diaphragm walls and their construction techniques in various soil types – Earth pressure on braced cuts and coffer dams – Design of coffer dams.

**TEXTBOOKS:**

**REFERENCE BOOKS:**

15CVL452  ENVIRONMENTAL GEOTECHNOLOGY  2 1 0 3

**Unit 1**
Environmental cycles - Soil and water - Environmental interaction relating to geotechnical problems - Effect of pollution on soil - water behaviour.

Origin, nature and distribution of soil - Description of individual particle - Soil fabric and structure - Gravitational and surface forces - Intersheet and interlayer bonding in the clay minerals - Basic structural units of clay minerals - Isomorphous substitution - Kaolinite mineral - Montmorillonite mineral - Illite mineral - Electric charges on clay minerals - Ion exchange capacity - Diffused double layer - Adsorbed water - Soil structure - Methods for the identification of minerals (introduction only).

Effect of drying on Atterberg limits - Shrinkage, swelling and cracking characteristics of soil - Electrochemical characteristics of soil-water system - Sensitivity of soil to environment - Soil-water-air interaction - Activity, sensitivity, causes of sensitivity - Influence of exchangeable cations, pH and organic matter on properties of soils - Permeability of soils - Hydraulic conductivity of different types of soils - Darcy’s law and its validity - Factors affecting permeability

**Unit 2**
Sources, types and composition of different wastes - Characteristics and classification of hazardous wastes - Generation rates - Potential problems in soils due to contaminants.

Ground water flow - Sources of ground water contamination - Contaminant transport - Pollution of aquifers by mining and liquid wastes - Ground water pollution downstream of landfills - Transport mechanisms.

**REFERENCE BOOKS:**

15CVL453  GROUND IMPROVEMENT TECHNIQUES  2 1 0 3

**Unit 1**
Objective of ground improvement - In-situ ground improvement methods - Introduction to soil improvements without the addition of many material - surface compaction – compaction piles in sand - impact compaction / dynamic compaction of sands – vibratory compaction in sand - vibroflotation in sand – explosions in sand - Terra probe method - replacement process - vibroflotation in clays - preloading techniques - sand drains - stone columns - introduction to soil improvement by thermal treatment - introduction to biotechnical stabilization.

**Unit 2**
Introduction to soil improvement by adding materials - lime stabilization – Mechanism - optimum lime content - lime fixation point - effect of lime on physical and engineering properties of soil - lime column method - stabilization of soft clay or silt...

Unit 3

Geosynthetics – Types - general applications - types of geotextiles and geo-grids - physical and strength properties of geotextiles and geogrids - behaviour of soils on reinforcing with geotextiles and geogrids - design aspects with geotextiles and geogrid.

TEXTBOOKS:

REFERENCE BOOKS:

15CVL455 GROUND WATER HYDROLOGY

Unit 1

TEXTBOOKS:

REFERENCE BOOKS:

15CVL456 REMOTE SENSING AND GIS

Unit 1
Introduction, Basic concepts and principles of remote sensing; Definition components of remote sensing - energy sensor, interacting body – active and passive remote sensing – platforms - EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface. Application; Meteorology, land use, networking, hydrological studies, soil studies and coastal zone analysis.

Unit 2
Photogrammetry; Aerial and Terrestrial; photo interpretation. Sensors; Radar imaging; colour scanners; thematic mapper.

Unit 3
Analysis using raster and vector data – retrieval, reclassification, overlaying, buffering - data output – printers and plotters. Open source softwares.

GIS and remote sensing applications – urban applications – water resources – urban analysis – watershed management – resources information system – hazard mitigation.

TEXTBOOKS:

REFERENCES:

15CVL457 SURFACE HYDROLOGY AND WATER POWER 2103

Unit 1


SYLLABI B. Tech - Civil Engg. 2015 admissions onwards


Unit 2


Unit 3
Planning for water power development – estimation of available water power-power duration curve - storage and pondage - load studies - load duration curve - variations in load factor - power system load - system integrated operational studies - load prediction - market requirements of power - installed capacity - Benefits evaluation of installed capacity.

Classification of hydropower development - storage power development - runoff river power development - pumped storage power development - small hydro power development.

Hydro power plants - power plant structure - layout of hydropower plants - types of power houses - sizing of power house.

Water conductor system – intakes - location and types of intakes - penstock and pressure shafts - water hammer - water hammer equation - types of surge tanks.

TEXTBOOKS:

REFERENCES:
**15CVL458 WATER RESOURCES SYSTEM PLANNING 2 1 0 3**
AND DESIGN

**Unit 1**

Hydrologic input analysis, Demand analysis, System elements & Subsystem planning - Stochastic planning and management - Design and management issues.

**Unit 2**
Optimization methods and their application in water resource systems. Linear programming and Dynamic programming models. Problem formulation for W. R systems – Multi-objective planning – Large scale system analysis - Case studies.

**Unit 3**
Ground water system planning – Conjunctive surface and G. W development - Hierarchical approach - Water quality management planning - Regional planning - Policy issues.

**REFERENCE BOOKS:**

**15CVL460 ADVANCED ENVIRONMENTAL ENGINEERING 2 1 0 3**

**Unit 1**
Instrumental methods for analysis of contaminants in air, water and soil - colorimetry, Chromatography, spectroscopy, electrochemical probes

Indoor and outdoor air pollution – meteorology - influence of solar radiation and wind fields - lapse rate and stability conditions - characteristics of stack plumes - effective stack height.

**TEXTBOOK:**

**REFERENCE BOOKS:**

**15CVL461 ENVIRONMENTAL IMPACT ASSESSMENT 2 1 0 3**

**Unit 1**
Concept of environment, Concept of environmental impact, Environmental impact assessment (EIA) – definitions, terminology and overview, Evolution of EIA in the USA, Key features of the National Environmental Policy Act and its implementation and the Council on Environmental Quality (CEQ) guidelines, Role of the USEPA, Evolution of EIA in India, Sustainable development, Generalised EIA process flow chart, Screening, Initial environmental examination (IEE), Scoping, Public participation.
Unit 2
Environmental baseline, Impact assessment methods – checklists – matrices - quantitative methods – networks - overlay mapping, Introduction to impact prediction and evaluation, Factors to be considered while assessing the impacts of water related projects, power projects, waste water treatment facilities etc. Major features of the EIA notification in India, Present status and procedures of EIA in India.

Unit 3
Prediction and assessment of impacts of developmental activities on surface water, land and soil, groundwater, air, biological environment etc.

Prediction and assessment of visual impacts, Socioeconomic impact analysis, Evaluation of alternatives, Preparing the EIA document, Environmental impact statement (EIS), Environmental monitoring, Environmental audit (EA), Case studies.

REFERENCE BOOKS:
7. Website of the Ministry of Environment and Forests, Govt. of India and the USEPA.

15CVL462 INDUSTRIAL WASTE TREATMENT 2 1 0 3

Unit 1

Unit 2

Treatment of industrial waste - suitability of different techniques - disposal of industrial waste.

REFERENCE BOOKS:

15CVL470 PAVEMENT DESIGN 2 1 0 3

Unit 1
Introduction: Types and component parts of pavements – factors affecting design and performance of pavements - comparison between highway and airport pavements - functions and significance of sub grade properties – various methods of assessment of sub grade soil strength for pavement design - cause and effects of variations in moisture content and temperature - depth of frost penetration - design of bituminous mixes by Marshall method.

Unit 2
Stress analyses and methods of flexible pavement design: stresses and deflections in homogeneous masses - burmister 2 layer and 3 layer theories - wheel load stresses - ESWL of multiple wheels - repeated loads and EWL factors - empirical, semi-empirical and theoretical approaches for flexible pavement design - group index, CBR, triaxial, mcleod and burnmister layered system methods.

Unit 3
Stresses analysis and methods of rigid pavement design: types of stresses and causes - factors influencing stresses, general conditions in rigid pavement analysis - ESWL - wheel load stresses - warping stresses - friction stresses - combined stresses - functions of various types of joints in cement concrete pavements -
design and detailing of slab thickness; longitudinal, contraction and expansion joints by IRC recommendations.

Pavement evaluation and rehabilitation.

TEXTBOOK:

REFERENCE BOOKS:

15CVL471 TRAFFIC ENGINEERING AND MANAGEMENT  2 1 0  3

Unit 1
Introduction - Objectives and scope of traffic engineering - Components of road traffic: vehicle, driver and road - Road user and vehicle characteristics and their effect on road traffic - Traffic manoeuvre - Traffic Stream Characteristics - Relationship between Speed, Flow and Density.

Objectives, methods, equipment, data collection, analysis and interpretation (including case studies) of (a) Speed and delay, (b) Origin and destination, (c) Parking, (d) Accident and other studies.

Unit 2
Design, Regulation and Management of Traffic Engineering Facilities: Control of traffic movements through time sharing and space sharing concepts - Design of channelising islands, T, Y, skewed, staggered, roundabout, mini-roundabout and other forms of at-grade crossings including provision for safe crossing of pedestrians and cyclists - Grade separated intersections: Warrants and design features - Bus stop location and bus bay design - Road lighting - Regulations on vehicles, drivers and traffic - Planning and design of traffic management measures: one-way streets, reversible lanes and roadways, turn regulation, transit and carpool lanes - Planning and design of pedestrian facilities – Traffic calming.

15CVL472 TRANSPORTATION SYSTEM MANAGEMENT  2 1 0  3

Unit 1
Traffic Control Devices and Environmental Control: Different methods of signal design - Redesign of existing signals including case studies - Signal coordination - Air and Noise pollution of different transport modes – Visual impacts - Impacts on land development -Technological approaches to improving environment.

TEXTBOOKS:

REFERENCE BOOKS:

15CVL473 TRANSPORTATION SYSTEM MANAGEMENT AND CONTROL
Surveillance, Study of following TSM Actions with respect to:
1) Problems Addressed
2) Conditions for Applications
3) Implementation Problems
4) Evaluation and Impact Analysis.

Public Transportation and HOV Treatment, Toll discounts for Car Pools during Peak periods, Park and Ride, Car pooling, Exclusive Bus & Two-wheeler Lanes, Priority at Ramp Terminals, Bus Transfer Stations, Limited Skip & Stop Bus Services & Shared Rides.

**Unit 3**
Demand Management: Staggered Working hours, Flexible Work hours, High Peak Period Tolls, Shuttle Services, Circulation Services and Extended Routes.

Traffic Operations Improvements: On-Street, Parking ban, Freeway Ramp Control and Closure, Travel on Shoulders, One-way Streets, Reversible Lanes, Traffic Calming, Right Turn Phase, Right Turn Lanes, Reroute Turning Traffic.

**TEXTBOOK:**

**REFERENCE BOOKS:**

**15CVL481 STRUCTURAL DESIGN AND DETAILING 0 0 2 1**

Design drawing and detailing of RC elements / structures – preparation of detailed design documents, schedules of structural elements and reinforcement details (structural drawing).
- Framed structure
- Retaining walls
- Water tanks

Design and detailing of steel elements / structures
- Built-up columns and Column bases
- Roof trusses and joints including purlins
- Gantry girder

Computer aided analysis and design
- Multi-storey frame analysis for dead, live and wind loads - Applications.
- Design of Reinforced concrete Beams, Columns – Footings – Steel beams – columns - Trusses

**TEXTBOOKS:**
SYLLABI
B. Tech - Civil Engg.
2015 admissions onwards


REFERENCE BOOKS:
3. SP:34-1987, “Handbook on Concrete Reinforcement and Detailing”, BIS.

15CVL491  PROFESSIONAL PROJECT  0 1 2 2

The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of a RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

15CVL495  PROJECT PHASE I  2 cr

The student is expected to start the initial planning and preparation for the final year project. They have to identify their team, project advisor and, plan the objectives, scope, methodology and the work schedule. A detailed literature review is also expected in this phase.

15CVL499  PROJECT PHASE II  10 cr

The student is expected to work on a topic in the field of Civil Engineering which could involve theoretical and/or fabrication and/or experimental and/or computational work. Evaluation will be done at the mid-course, as well as at the end of the semester.

15EEE180  WORKSHOP B  0 0 2 1

Part A - Electronics
Identification of electronic components (Passive and Active)
Study of measuring instruments (Voltmeter, Ammeter and Multimeter)
Measurement and theoretical Verification of series and parallel combination of resistors and capacitors
Calibration of CRO and measurements of signal parameters (RMS, maximum value, peak value, time and frequency)
Calibration of function generator using CRO
Soldering practice

Part B - Electrical
1. Study on power supply and protective devices
2. Study on tools and electrical accessories
3. Study on sources of light
4. Study on energy efficiency
5. Study on water pump
6. Study on house hold appliances:
   a. Iron box
   b. Fan
   c. Refrigerator
   d. Air conditioner
7. House wiring I – Glow an incandescent lamp using SPST switch
8. House wiring II – Glow a fluorescent lamp using SPST switch
9. House wiring III – Operate a fan and an incandescent lamp using two independent SPST switch
10. House wiring IV – Operate a fluorescent lamp and a 3 pin socket using two independent SPST switch
11. House wiring V – Staircase wiring
12. House wiring VI – Godown wiring

15ENG111  COMMUNICATIVE ENGLISH  2 0 2 3

OBJECTIVES: To make the students communicate their thoughts, opinions, and ideas freely and naturally; to make them understand the different styles in communication; to make the students understand the aesthetics of reading and writing; to bring in a spirit of enquiry; to motivate critical thinking and analysis; to help them ruminate on human values.

Unit 1
Reading: Different styles of communication – Reading Comprehension - critical thinking and analysis – Note-making – Any two pieces from the text.

Unit 2
Writing: Prewriting techniques - Kinds of paragraphs - basics of continuous writing.
Grammar & Usage: Parts of Speech, Tenses, Concord, Phrasal Verbs, Modal Auxiliaries, Modifiers (Workbook) - Any two pieces from the text.

Unit 3
Practical sessions (Listening & Speaking): Introduction to English pronunciation including minimal pairs and word stress – differences between British and American English – Listening comprehension and Note-taking - Any two pieces from the text.
Activities: Short speeches, seminars, quizzes, language games, debates, and discussions, Book Reviews, etc.

Text: Language through Reading: Compilation by Amrita University for internal circulation

Poems:
1. The Poplar Field by William Cowper
2. Telephone Conversation by Wole Soyinka

Prose:
1. Higher Mathematics by R. K. Narayan
2. Wings of Fire by Abdul Kalam (Part III.11)

Short Stories:
1. Best Investment I Ever Made by A. J. Cronin
2. Death of an Indian by Krishna Charan Das

Activities: Short speeches, seminars, quizzes, language games, debates, and discussions, Book Reviews, etc.

Text: Language through Reading: Compilation by Amrita University for internal circulation

Poems:
1. The Poplar Field by William Cowper
2. Telephone Conversation by Wole Soyinka

Prose:
1. Higher Mathematics by R. K. Narayan
2. Wings of Fire by Abdul Kalam (Part III.11)

Short Stories:
1. Best Investment I Ever Made by A. J. Cronin
2. Death of an Indian by Krishna Charan Das

Activities

Case studies & role-plays.

BOOKS RECOMMENDED:

OBJECTIVES: To expose the students to the greatness of Indian Thought in English; to develop a sense of appreciation for the lofty Indian Thought; to develop an understanding of the eclectic Indian psyche; to develop an understanding about the societal changes in the recent past.

Unit 1 Poems
Rabindranath Tagore's Gitanjali (1-10); Nizzim Ezekiel's Enterprise; A. K. Ramanujam's Small-Scale Reflections on a Great House.

Unit 2 Prose
Khushwant Singh's The Portrait of a Lady; Jhumpa Lahiri's Short Story - Interpreter of Maladies.

Unit 3 Drama and Speech
Vijay Tendulkar's Silence, the Court is in Session; Motivational speeches by Jawaharlal Nehru / S. Radhakrishnan / A. P. J. Abdul Kalam's My Vision for India etc. (any speech).

REFERENCES:

OBJECTIVES: To expose the students to different genres of Literature; to hone reading skills; to provide deeper critical and literary insights; to enhance creative thinking; to promote aesthetic sense.

Unit 1 Poems

Book Reviews, etc.
SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

Unit 2 Short Stories

Unit 3 Prose

Practicals:
Role plays: The Proposal, Chekov / Remember Caesar, Gordon Daviot / Final Solutions, Maheesh Dattani, Book reviews, Movie reviews.

SUGGESTED READING: The Old Man and the Sea, Hemingway / Any one of the novels of R. K. Narayan, etc.

15ENG233 TECHNICAL COMMUNICATION 1022

OBJECTIVES: To introduce the students to the elements of technical style; to introduce the basic elements of formal correspondence; to introduce technical paper writing skills and methods of documentation; to improve oral presentation skills in formal contexts.

Unit 1

Unit 2
Different kinds of written documents: Definitions – descriptions – instructions – recommendations - manuals - reports – proposals; Formal Correspondence: Letter Writing including job applications with Resume.

Unit 3

Practice in oral communication and Technical presentations

REFERENCES:

15ENV234 INDIAN SHORT STORIES IN ENGLISH 1022

OBJECTIVES: To help the students learn the fine art of story writing; to help them learn the techniques of story telling; to help them study fiction relating it to the socio - cultural aspects of the age; to familiarize them with different strategies of reading short stories; to make them familiar with the morals and values held in high esteem by the ideals of Indianness.

Unit 1

Unit 2

Unit 3
Masti Venkatesha Iyengar: The Curds-Seller; Manohar Malgonkar: Upper Division Love; Romila Thapar: The Spell; Premchand: The Voice of God.

TEXT:

REFERENCE:

15ENV300 ENVIRONMENTAL SCIENCE AND SUSTAINABILITY 3003

Unit 1
State of Environment and Unsustainability, Need for Sustainable Development, Traditional conservation systems in India, People in Environment, Need for an attitudinal change and ethics, Need for Environmental Education, Overview of International Treaties and Conventions, Overview of Legal and Regulatory Frameworks.

Environment: Abiotic and biotic factors, Segments of the Environment, Biogeochemical Cycles, Ecosystems (associations, community adaptations, ecological succession, Food webs, Food chain, ecological pyramids), Types of Ecosystems – Terrestrial ecosystems, Ecosystem Services, Economic value of ecosystem services, Threats to ecosystems and conservation strategies.

Biodiversity: Species, Genetic & Ecosystem Diversity, Origin of life and significance of biodiversity, Value of Biodiversity, Biodiversity at Global, National and Local Levels,
India as a Mega-Diversity Nation (Hotspots) & Protected Area Network, Community Biodiversity Registers. Threats to Biodiversity, Red Data book, Rare, Endangered and Endemic Species of India. Conservation of Biodiversity. People’s action.

Impacts, causes, effects, control measures, international, legal and regulatory frameworks of: Climate Change, Ozone depletion, Air pollution, Water pollution, Noise pollution, Soil / land degradation / pollution

Unit 2
Linear vs. cyclical resource management systems, need for systems thinking and design of cyclical systems, circular economy, industrial ecology, green technology. Specifically apply these concepts to: Water Resources, Energy Resources, Food Resources, Land & Forests, Waste management.

Discuss the interrelation of environmental issues with social issues such as: Population, Illiteracy, Poverty, Gender equality, Class discrimination, Social impacts of development on the poor and tribal communities, Conservation movements: people’s movements and activism, Indigenous knowledge systems and traditions of conservation.

Unit 3

Global and national state of housing and shelter, Urbanization, Effects of unplanned development case studies, Impacts of the building and road construction industry on the environment, Eco-homes / Green buildings, Sustainable communities, Sustainable Cities.

Ethical issues related to resource consumption, Intergenerational ethics, Need for investigation and resolution of the root cause of unsustainability, Traditional value systems of India, Significance of holistic value-based education for true sustainability.

TEXTBOOKS / REFERENCES:

15FRE230 PROFICIENCY IN FRENCH LANGUAGE (LOWER) 1 0 2 2

Unit 1 Population - Identity
How to introduce yourself (name, age, address, profession, nationality); Numbers; How to ask questions;

Grammar – Pronouns - subjects; Regular verbs of 1st group (er) in the present; Être (to be) and avoir (to have) in the present; Interrogative sentence; Gender of adjectives.

Unit 2 The suburbs - At the train station
Introduce someone; Buy a train ticket or a cinema ticket; Ask for information; Official time; Ask for a price; The city (church, town hall, post office…)

Grammar – Pronouns - subjects (continuation); Gender of adjectives (continuation); Plural of nouns and adjectives; Definite and indefinite articles; Interrogative adjectives; I would like (Je voudrais).

Unit 3 Paris and the districts - Looking for a room
Locate a room and indicate the way; Make an appointment; Give a price; Ordinal numbers; Usual time; Ask for the time.

Grammar - Imperative mode; Contracted articles (au, du, des); negation.

TEXTBOOK:
Metro St Michel - Publisher: CLE international

15FRE231 PROFICIENCY IN FRENCH LANGUAGE (HIGHER) 1 0 2 2

Unit 1 The first room of a student
A party to celebrate the 1st room; Description of a room; furniture; Locate objects: prepositions (devant, derrière, dans…), Read advertisement; Appreciation (I like, I prefer.,)

Grammar - Perfect past tense with avoir; Possessive adjectives (mon, ton, son…); Demonstrative adjectives (ce, cet, cette); Yes (oui, si).

Unit 2 Small jobs
Conversation on the phone; Give Time indications; Answer a job offer; Describe a job; Suggest a meeting time.
Grammar - Perfect past tense with être and avoir (continuation); Possessive adjectives (notre, votre, leur); Prepositions (à, pour, avec ...); Pronoun as direct object (le, la, l', les).

Unit 3 University Restaurant
Inquiry; Express an opinion; Ask questions (continuation); Food, meals, taste, preferences; Nutrition, diet, choose a menu or diet, Expression of quantities (beaucoup, peu).

Grammar - Partitif (expressing quantity) (du, de la, pas de...); Comparison (plus ...que, moins...que, autant ...que); Interrogation (continuation), inversion, Qu'est-ce que, qu'est-ce que?.

TEXTBOOK:
Metro St Michel - Publisher: CLE International

15GER230 GERMAN FOR BEGINNERS I 1 0 2 2

Unit 1
Greetings; Introducing one-self (formal and informal context), saying their name, origin, living place, occupation.

Numbers 1-100; Saying the telephone number.

Countries and Languages.

Grammar: Structure – W - Questions and Yes/No questions and statements, personal pronouns, verb conjugations. Articles.

Vocabulary: Professions.

Unit 2
Giving the personal details. Name, age, marital status, year of birth, place of birth, etc.

Numbers till 1000. Saying a year.

Alphabets – spelling a word.

Filling up an application form; In the restaurant – making an order.

Grammar: Definite, indefinite and negative article in nominative. Accusative: definite and negative Article

Vocabulary: Food items

15GER231 GERMAN FOR BEGINNERS II 1 0 2 2

Unit 1
Shopping and orientation in supermarket; Conversation between the customer and salesman; Where one finds what in supermarket; Asking for requests and suggestions.

Grammar: Dative of personal pronouns. Imperative form.

Vocabulary: Consumables and measurements;

Unit 2
Appointments; Work and leisure time activities; Time, weekdays, months and seasons; saying the date; fixing up an appointment.

Grammar: Model verbs; Prepositions with time and place; Ordinal numbers.

Vocabulary: Leisure activities, weekdays, months and seasons.

Unit 3
Family and household; Family and relations; household and daily routine.

Grammar: Possessive articles; Divisible and indivisible verbs.

Vocabulary: Family circle; Household articles.

15GER232 PROFICIENCY IN GERMAN LANGUAGE (LOWER) 1 0 2 2

To have an elementary exposure to German language; specifically
1. to have some ability to understand simple spoken German, and to be able to speak it so as to be able to carry on life in Germany without much difficulty (to be able to do shopping, etc.);
2. to be able to understand simple texts, and simple forms of written communication;
3. to have a basic knowledge of German grammar;
4. to acquire a basic vocabulary of 500 words;
5. to be able to translate simple letters with the use of a dictionary; and
6. to have some familiarity with the German life and culture.
(This will not be covered as part of the regular classroom teaching; this is to be
acquired by self-study.)

Some useful websites will be given.

15GER233  PROFICIENCY IN GERMAN LANGUAGE (HIGHER)  1 0 2  2

The basic vocabulary and grammar learned in the earlier course is mostly still
passive knowledge. The endeavour of this course is to activate this knowledge
and develop the skill of communication.

Topics are: Airport, railway station, travelling; shopping; invitations, meals, meeting
people; around the house; the human body; colours; professions.

Past and future tenses will be introduced. Applying genitive, dative and accusative.

Some German culture. Films.

15HIN101  HINDI I  1 0 2  2

OBJECTIVES: To teach Hindi for effective communication in different spheres of life - Social
context, Education, governance, Media, Business, Profession and Mass communication.

Unit 1
Introduction to Hindi Language, National Language, Official Language, link Language etc. Introduction to Hindi language, Devanagari script and Hindi alphabet.

Shabda Bhed, Roopantar ki Drishti se - Bhasha – Paribhasha aur Bhed - Sangya - Paribhasha Aur Bhed - Sangya ke Roopantar - kriya.

Unit 2
Common errors and error corrections in Parts of Speech with emphasis on use of
pronouns, Adjective and verb in different tenses – Special usage of adverbs,
changing voice and conjunctions in sentences, gender& number - General
vocabulary for conversations in given context –understanding proper pronunciation –
Conversations, Interviews, Short speeches.

Unit 3
Poems – Kabir 1st 8 Dohas, Surdas 1st 1 Pada; Tulsidas 1st 1 Pada; Meera 1st 1
Pada

15HIN111  HINDI II  1 0 2  2

OBJECTIVES: Appreciation and assimilation of Hindi Literature both drisya & shravya using the
best specimens provided as anthology.

Unit 1
Kavya Tarang; Dhumil ke Anthim Kavitha [Poet-Dhumil]; Dhabba [Poet-Kedarnath Singh]; Proxy [Poet-Venugopal]; Vakth [Poet-Arun Kamal]; Maachis [Poet-Suneeta Jain].

Unit 2
Communicative Hindi - Moukhik Abhivyakthi

Unit 3
Audio-Visual Media in Hindi – Movies like Tare Zameen par, Paa, Black etc.,
appreciation and evaluation. News reading and presentations in Radio and TV
channels in Hindi.

Unit 4
Gadya Manjusha – Budhapa, Kheesa, Sadachar ka Thavis

Unit 5
to Hindi Software.

BOOKS:
15HUM230  EMOTIONAL INTELLIGENCE  2002

Unit 1
Emotional Intelligence: Concept of Emotional Intelligence, Understanding the history and origin of Emotional Intelligence, Contributors to Emotional Intelligence, Science of Emotional Intelligence, EQ and IQ, Scope of Emotional Intelligence.

Unit 2

Unit 3
Emotional Intelligence at Work place: Importance of Emotional Intelligence at Work place? Cost–savings of Emotional Intelligence, Emotionally Intelligent Leaders, Case Studies Measuring Emotional Intelligence: Emotionally Intelligence Tests, Research on Emotional Intelligence, Developing Emotional Intelligence.

REFERENCES:

15HUM231  GLIMPSES INTO THE INDIAN MIND: 2002
THE GROWTH OF MODERN INDIA

Unit 1
Introduction
General Introduction; ‘His + Story’ or ‘History’ ?: The concepts of ‘nation’, ‘national identity’ and ‘nationalism’; Texts and Textualities: Comparative Perspectives.

Unit 2
Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:
Raja Ram Mohan Roy; Dayananda Saraswati; Bal Gangadhar Tilak; Rabindranath Tagore;

REFERENCES:
1. Tilak, Bal Gangadhar. The Orion / Arctic Home in the Vedas.
2. Tagore, Rabindranath. The History of Bharatarashtra / On Nationalism / Greater India.

15HUM232  GLIMPSES OF ETERNAL INDIA  2002

Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajamandala and the Cakravartins – Ramarajya – Yudhisthira’s ramarajya; Sarasvati - Sindhu Civilization and the myth of the Aryan Invasion; Classical India – Dharma as the bedrock of Indian society – Vaidika Brahmanya Dharma and the rise of Jainism and Buddhism – the sixteen Mahajanapadas and the beginning of Magadhan paramountcy – Kautilya and his Arthasastra – Chandragupta Maurya and the rise of the Mauryan empire – Gupta dynasty Indian art and architecture – classical sanskrit literature – Harsavardhana; Trade and commerce in classical and medieval India and the story of Indian supremacy in the Indian ocean region: The coming of Islam – dismantling of the traditional Indian polity – the Mughal empire – Vijayanagara samrajya and days of Maratha supremacy.
Unit 2
Indi a's contribution to the world: spirituality, philosophy and sciences
Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabarata; Bhagavad Gita; Saints and sages of India; Ancient Indian medicine; towards an unbiased perspective; Ancient Indian mathematics; Ancient Indian astronomy; Ancient Indian science and technology.

The arrival of Europeans, British paramountcy and colonization
What attracted the rest of the world to India?; India on the eve of the arrival of European merchants; The story of colonization and the havoc it wreaked on Indian culture and civilization; Macaulay and the start of the distortion of Indian education and history; Indian economy – before and after colonization: a brief survey; The emergence of modern India.

Unit 3
Women in Indian society
The role and position of women in Hindu civilization; Gleanings from the Vedas, Brihadarnyaka Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya's Arthasastra and Mrichchhakatikam of Sudraka; The role and position of Indian women vis-a-vis Islam and European cultures; The great women of India.

Modern India
The national movement for freedom and social emancipation; Swami Vivekananda, Sri Aurobindo, Rabindranath Tagore; Understanding Mahatma Gandhi; A new nation is born as a republic – the pangs of birth and growth; India since Independence – the saga of socio-political movements; Problems facing the nation today; Globalization and Indian Economy; Bharatavarsha today and the way ahead: Regeneration of Indian National Resources.

Conclusion
The Wonder that was India; The ‘politics’ and ‘purpose’ of studying India.

REFERENCES:

Schools of Engineering Amrita Vishwa Vidyapeetham S 105

SYLLABI B. Tech - Civil Engg. 2015 admissions onwards

17. Aurobindo, Sri. The Indian Renaissance / India's Rebirth / On Nationalism.
25. Danino, Michel. The Invasion That Never Was.
34. Dhamanpail. Archival Compilations (unpublished)

15HUM233 GLIMPSES OF INDIAN ECONOMY AND POLITY 2 0 0 2

Unit 1
Introduction
General Introduction; Primitive man and his modes of exchange – barter system; Prehistoric and proto-historic polity and social organization.

Ancient India – up to 600 B.C.
Early India – the vedic society – the varnasramadharma – socio-political structure
of the various institutions based on the four purusarthas; The structure of ancient Indian polity – Rajamandala and Cakravartins – Prajamandala; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramarajya) – Yudhisthira’s ramarajya; Sarasvatī - Sindhu civilization and India’s trade links with other ancient civilizations; Towards chiefdoms and kingdoms – transformation of the polity: kingship – from gopati to bhupati; The mahajanapadas and the emergence of the sreni’s – states and cities of the Indo-Gangetic plain.

Unit 2
Classical India: 600B.C. – 1200 A.D.
The rise of Magadha, emergence of new religions – Buddhism and Jainism – and the resultant socio-economic impact; The emergence of the empire – the Mauryan Economy and Kautilya’s Arthasastra; of Politics and trade – the rise of the Mercantile Community; Elements from the age of the Kushanans and the Great Guptas; India’s maritime trade; Dharma at the bedrock of Indian polity – the concept of Digvijaya; dharma-vijaya, lobha-vijaya and asura-vijaya; Glimpses into the south Indian economies: political economies of the peninsula – Chalukyas, Rashtrakutas and Cholas

Medieval India: 1200 A.D. – 1720 A.D.
Advent of Islam – changes in the social institutions; Medieval India – agrarian economy, non-agricultural production and urban economy, currency system; Vijayanagara samrajya and maritime trade – the story of Indian supremacy in the Indian Ocean region; Aspects of Mughal administration and economy; The Maratha and other provincial economies.

Unit 3
Modern India: 1720 - 1947
the Indian market and economy before the arrival of the European traders; Colonisation and British supremacy (dismantling of everything that was ‘traditional’ or ‘Indian’) – British attitude towards Indian trade, commerce and economy and the resultant ruining of Indian economy and business – man-made famines – the signs of renaissance: banking and other business undertakings by the natives (the members of the early Tagore family, the merchants of Surat and Porbander, businessmen of Bombay, etc. may be referred to here) – the evolution of the modern banking system; Glimpses into British administration of India and administrative models; The National movement and nationalist undertakings in business and industry; the Tatas and the Birlas; Modern India: the growth of large-scale industry – irrigation and railways – money and credit – foreign trade; Towards partition – birth of two new nations – division of property; The writing of the Indian Constitution – India becomes a democratic republic – a new polity is in place.

Conclusion
REFERENCES:
1. The Cultural Heritage of India. Kolkata: Ramakrishna Mission Institute of Culture.
15HUM234 HEALTH AND LIFE STYLE 1 0 2 2

Unit 1 Introduction to Health
Health is wealth; Role of lifestyle habits on health; Importance of adolescence; Stages, Characteristics and changes during adolescence; Nutritional needs during adolescence why healthy lifestyle is important for adolescence. Eating Habits - eating disorders, skipping breakfast, junk food consumption.

Practicals - Therapeutic Diets

Unit 2 Food and Nutritional Requirements during Adolescence
Fluid intake; nutrition related problems; lifestyle related problems, Role of physical activity; resting pattern and postures, Personal habits – alcoholism, and other tobacco products, electronic addiction etc

Practicals - Ethnic Foods

Unit 3 Need for a Positive Life Style Change
Peer pressure & procrastination, Stress, depression, suicidal tendency, Mini project review and viva, Whole portions revision.

Practicals - Cooking without Fire or Wire-healthy Snacks

TEXTBOOKS:

REFERENCE BOOKS:
WHO Report on Adolescent Health: 2010

15HUM235 INDIAN CLASSICS FOR THE TWENTY-FIRST CENTURY 2 0 0 2

Unit 1 Introductory study of the Bhagavad Gita and the Upanishads.

Unit 2 The relevance of these classics in a modern age.

Unit 3 Goals of human life - existential problems and their solutions in the light of these classics etc.

REFERENCE:
The Bhagavad Gita, Commentary by Swami Chinmayananda

15HUM236 INTRODUCTION TO INDIA STUDIES 2 0 0 2

PREAMBLE: This paper will introduce the students to the multiple dimensions of the contribution of India to the fields of philosophy, art, literature, physical and social sciences. The paper intends to give an insight to the students about the far-reaching contributions of India to world culture and thought during the course of its long journey from the hoary antiquity to the present times. Every nation takes pride in its achievements and it is this sense of pride and reverence towards the achievements that lays the foundation for its all-round progress.

Unit 1 A brief outline of Indian history from prehistoric times to the present times.

Contributions of India to world culture and civilization: Indian Philosophy and Religion; Art and Literature; Physical and Social Sciences.

Unit 2 Modern India: Challenges and Possibilities.

Scientific and technological progress in post-independence era; Socio-cultural and political movements after independence; Challenges before the nation today - unemployment – corruption – degradation of cultural and moral values - creation of a new system of education; Creation of a modern and vibrant society rooted in traditional values.

Unit 3 Modern Indian Writing in English: Trends in Contemporary Indian Literature in English.

TEXTBOOK:
Material given by the Faculty

BACKGROUND LITERATURE:
1 Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
2 Selections from the Complete Works of Swami Vivekananda, Advaita Ashrama publication.
3 Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
4 Outlines of Indian Philosophy, M. Hiriyanan, MLBD.
5 An Advanced History of India, R. C. Majumdar et al, Macmillan.
6 India Since 1526, V. D. Mahajan, S. Chand & Company
7 The Indian Renaissance, Sri Aurobindo.
8 India’s Rebirth, Sri Aurobindo.
On Nationalism, Sri Aurobindo.
13 Awaken Children: Conversations with Mata Amritanandamayi
14 Indian Aesthetics, V. S. Seturaman, Macmillan.
15 Indian Philosophy of Beauty, T. P. Ramachandran, University of Madras, Chennai.
16 Web of Indian Thought, Sister Nivedita
17 Essays on Indian Nationalism, Anand Kumaraswamy
18 Comparative Aesthetics, Volume 2, Kanti Chandra Pandey, Chowkhamba, Varanasi
19 The Invasion That Never Was, Michel Danino
20 Samskara, U. R. Ananthamurthy, OUP.
21 Hayavadana, Girish Karnard, OUP.
22 Naga-Mandala, Girish Karnard, OUP.

15HUM237 INTRODUCTION TO SANSKRIT LANGUAGE AND LITERATURE

OBJECTIVES: To familiarize students with Sanskrit language; to introduce students to various knowledge traditions in Sanskrit; to help students appreciate and imbibe India's ancient culture and values.

Unit 1

Unit 2
Language Studies - Role of Sanskrit in Indian & World Languages.

Unit 3

Unit 4

15HUM238 NATIONAL SERVICE SCHEME

Unit 1
Introduction to Basic Concepts of NSS: History, philosophy, aims and objectives of NSS, Emblem, flag, motto, song, badge etc., Organisational structure, roles and responsibilities of various NSS functionaries.

NSS Programmes and Activities: Concept of regular activities, special campaigning, Day Camps, Basis of adoption of village / slums, methodology of conducting survey, financial pattern of the scheme, other youth programme/schemes of GOI, Coordination with different agencies, Maintenance of the Diary.

Unit 2
Volunteerism and Shramdan: Indian Tradition of volunteerism, Needs and importance of volunteerism, Motivation and Constraints of volunteerism, Shramdan as part of volunteerism, Amalabharatam Campaign, Swatch Bharath.

Unit 3
Understanding youth: Definition, profile and categories of youth, Issues, challenges and opportunities for youth, Youth as an agent of social change.

Youth and Yoga: History, philosophy and concept of Yoga, Myths and misconceptions about Yoga, Different Yoga traditions and their impacts, Yoga as a preventive and curative method, Yoga as a tool for healthy life style.

Unit 4
Youth Development Programmes in India: National Youth Policy, Youth development programmes at the national level, state level and voluntary sector, youth-focused and youth-led organizations.

Unit 5
Environmental Issues: Environment conservation, enrichment and sustainability, climate change, waste management, rain water harvesting, energy conservation, waste land development.

Project Work / Practical

15HUM239 PSYCHOLOGY FOR EFFECTIVE LIVING 2002

Unit 1 Self-Awareness & Self-Motivation
Self analysis through SWOT, Johari Window, Maslow's hierarchy of motivation, importance of self esteem and enhancement of self esteem.

Unit 2 The Nature and Coping of Stress

Unit 3 Application of Health Psychology
Health compromising behaviours, substance abuse and addiction.

TEXTBOOKS:

REFERENCE BOOKS:

15HUM240 PSYCHOLOGY FOR ENGINEERS 2002

Unit 1
Psychology of Adolescents: Adolescence and its characteristics.

Unit 2
Learning, Memory & Study Skills: Definitions, types, principles of reinforcement, techniques for improving study skills, Mnemonics.

Unit 3
Attention & Perception: Definition, types of attention, perception.

TEXTBOOKS:

REFERENCE BOOKS:
Unit 1
Introduction: Relevance of Bhagavad Gita today – Background of Mahabharatha.


TEXTBOOKS / REFERENCES:
REFERENCES:
1. The Message of the Upanishads by Swami Ranganathananda, Bharatiya Vidya Bhavan
2. Eight Upanishads with the commentary of Sankaracharya, Advaita Ashrama
3. Indian Philosophy by Dr. S. Radhakrishnan, Oxford University Press
4. Essentials of Upanishads by R L Kashyap, SAKSI, Bangalore
5. Upanishads in Daily Life, Sri Ramakrishna Math, Mysalore.
7. Upanishad Ganga series – Chinmaya Creations

15HUM244 UNDERSTANDING SCIENCE OF FOOD AND NUTRITION

Unit 1 Food and Food Groups
Introduction to foods, food groups, locally available foods, Nutrients, Cooking methods, Synergy between foods, Science behind foods, Food allergies, food poisoning, food safety standards.

Cookery Practicals - Balanced Diet

Unit 2 Nutrients and Nutrition
Nutrition through life cycle, RDA, Nutrition in disease, Adulteration of foods & Food additives, Packaging and labeling of foods.

Practicals - Traditional Foods

Unit 3 Introduction to Food Biotechnology
Future foods - Organic foods and genetically modified foods, Fortification of foodsvalue addition of foods, functional foods, Nutraceuticals, supplementary foods, Processing and preservation of foods, applications of food technology in daily life, and your prospects associated with food industry – Nanoparticles, biosensors, advanced research.

Practicals - Value added foods

TEXTBOOKS:

REFERENCE BOOKS:

15JAP230 PROFICIENCY IN JAPANESE LANGUAGE (LOWER) 1 0 2 2

This paper will introduce the basics of Japanese language. Students will be taught the language through various activities like writing, reading, singing songs, showing Japanese movies etc. Moreover this paper intends to give a thorough knowledge on Japanese scripts that is Hiragana and Katakana. Classes will be conducted throughout in Japanese class only. Students will be able to make conversations with each other in Japanese. Students can make self-introduction and will be able to write letters in Japanese. All the students will be given a text on Japanese verbs and tenses.

Students can know about the Japanese culture and the lifestyle. Calligraphy is also a part of this paper. Informal sessions will be conducted occasionally, in which students can sing Japanese songs, watch Japanese movies, do Origami – pattern making using paper.

15JAP231 PROFICIENCY IN JAPANESE LANGUAGE (HIGHER) 1 0 2 2

Students will be taught the third and the most commonly used Japanese script, Kanji. Students will be taught to write as well as speak.

Students will be given detailed lectures on Calligraphy.

This version of the course includes a new project where the students should make a short movie in Japanese language selecting their own topics.

By the end of the semester they the students will master the subject in all means. They will be able to speak Japanese as fluently as they speak English. Students will be encouraged to write stories and songs in Japanese language themselves.

15KAN101 KANNADA I 1 0 2 2

OBJECTIVES: To enable the students to acquire basic skills in functional language; to develop independent reading skills and reading for appreciating literary works; to analyse language in context to gain an understanding of vocabulary, spelling, punctuation and speech.

Unit 1
Adalitha Kannada: bhashe, swaroopa, belavaniyega kiru parichaya
Paarbhaashika padagalu
Vocabulary Building
Unit 2
Prabhandha – Vyaaghra Geethe - A. N. Murthy Rao
Prabhandha - Baredidi...baredidi, Baduku mugiyuvudilla allige...- Nemi Chandra
Paragraph writing – Development: comparison, definition, cause & effect
Essay – Descriptive & Narrative

Unit 3
Mochi – Bharateepriya
Mosarina Mangamma – Maasti Venkatesh Iyengar
Kalamaapuruda Hotelnalli – Panje Mangesh Rao
Kaanike – B. M. Shree
Geleyanobbanige bareda Kaagada – Dr. G. S. Shivarudrappa
Moodala Mane – Da. Ra. Bendre
Swathantryada Hanate – K. S. Nissaar Ahmed

Unit 4
Letter Writing - Personal: Congratulation, thanks giving, invitation, condolence

Unit 5
Reading Comprehension; nudigattu, gaadegalu
Speaking Skills: Prepared speech, pick and speak

REFERENCES:
1. H. S. Krishna Swami Iyangar – Adalitha Kannada – Chetana Publication, Mysuru
2. A. N. Murthy Rao – Aleyyu Mana – Kuvempu Kannada Adyayana Samste
3. Nemi Chandra – Badhuku Badalisabahudu – Navakarnataka Publication
4. Sanna Kathegalu - Prasaranga, Mysuru University, Mysuru
5. B. M. Shree – Kannadada Bavuta – Kannada Sahitya Parishatthu
6. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna Book House (P) Ltd.
7. Dr. G. S. Shivarudrappa – Samagra Kavya – Kamadhenu Pustaka Bhavana

15KAN111 KANNADA II 1 0 2 2

OBJECTIVES: To enable the students to acquire basic skills in functional language; to develop independent reading skills and reading for appreciating literary works; to develop functional and creative skills in language; to enable the students to plan, draft, edit & present a piece of writing.

Unit 1
Official Correspondence: Adhikrutha patra, prakatane, manavi patra, vanijya patra

Unit 2
Nanna Hanate - Dr. G. S. Shivarudrappa

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Unit 3
Ella Marehiruvaga - K. S. Nissaar Ahmed
Savitruru Nadigalu – S Siddalingayya

Unit 3

Unit 4
Sanva Sollegala turtu Maha Samelana - Beechi
Swarthakkaagi Tyaga - Beechi

Unit 5
Essay writing: Argumentative & Analytical
Précis writing

REFERENCES:
1. H. S. Krishnaswami Iyangar – Adalitha Kannada – Chetan Publication, Mysuru
2. Dr. G. S. Shivarudrappa – Samagra Kavya. - Kamadhenu Pustaka Bhavana
4. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna book house
5. Dr. Da. Ra. Bendre – Saayo Aata – Shri Maata Publication

15MAL101 MALAYALAM I 1 0 2 2

OBJECTIVES: To appreciate the aesthetics & cultural implications; to enhance creative thinking in mother-tongue; to learn our culture & values; to equip students read & write correct Malayalam; to correct the mistakes in pronunciation; to create awareness that good language is the sign of complete personality.

Unit 1
Ancient poet trio: Adhyatmaramayanam, Lakshmana Swanthanam (valsa soumitre... mungikidakayal), Ezhuthachan - Medieval period classics – Jnanappana (kalaminnu... vilasangalingane), Poonthanam

Unit 2

Unit 3
Short stories from period 1/2/3, Poovanpazham - Vaikaom Muhammed Basheer - Literary & Cultural figures of Kerala and about their literary contributions.
**SYLLABI**

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**Unit 4**


**Unit 5**

Error-free Malayalam: 1. Language; 2. Clarity of expression; 3. Punctuation – Thettillatha Malayalam

Writing - a. Expansion of ideas; b. Précis Writing; c. Essay Writing; d. Letter writing; e. Radio Speech; f. Script / Feature / Script Writing; g. News Editing; h. Advertising; i. Editing; j. Editorial Writing; k. Critical appreciation of literary works (Any one or two as an assignment).

**REFERENCES:**


**15MAL111 MALAYALAM II 1 0 2 2**

**OBJECTIVES:** To appreciate the aesthetics & cultural implications; to enhance creative thinking in mother-tongue; to learn our culture & values; to equip students read & write correct Malayalam; to correct the mistakes in pronunciation; to create awareness that good language is the sign of complete personality.

**Unit 1**


**Unit 2**


**Unit 3**


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**Unit 4**

Part of an autobiography / travelogue: Kannerum Kinavum, V. T. Bhattathirippadu - Socio-cultural literature - historical importance.

**Unit 5**

Error-free Malayalam - 1. Language; 2. Clarity of expression; 3. Punctuation – Thettillatha Malayalam

Writing - a. Expansion of ideas; b. Précis Writing ; c. Essay Writing; d. Letter writing; e. Radio Speech; f. Script / Feature / Script Writing; g. News Editing; h. Advertising; i. Editing; j. Editorial Writing; k. Critical appreciation of literary works (Any one or two as an assignment).

**REFERENCES:**

1. Narayana Pillai, P. K, Sathiya Panchanan, Vimarsanathrayam, Kerala Sahitya Academy, 2000

**15MAT111 CALCULUS AND MATRIX ALGEBRA 2 1 0 3**

**Unit 1 Calculus**


Limit and Continuity: Limit (One-Sided and Two-Sided) of Functions. Continuous Functions, Discontinuities, Monotonic Functions, Infinite Limits and Limit at Infinity.

**Unit 2 Differentiation and its Applications:** Derivative of a function, non differentiability, Intermediate Value Property, Mean Value Theorem, Extreme Values of Functions, Monotonic Functions, Concavity and Curve Sketching, Integration: Definite Integrals, The Mean Value Theorem for definite integrals, Fundamental Theorem of Calculus, Integration Techniques.

**Unit 3 Matrix Algebra**

Review: System of linear Equations, linear independence

Eigen values and Eigen vectors: Definitions and Properties, Positive definite, Negative Definite and Indefinite Matrices, Diagonalization and Orthogonal Diagonalization, Quadratic form, Transformation of Quadratic Form to Principal axes, Symmetric and Skew Symmetric Matrices, Hermitian and Skew Hermitian
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TEXTBOOKS:

REFERENCE BOOKS:

15MAT121 VECTOR CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS

Unit 1

Vector Integration: Line Integral, Line Integrals Independent of Path. Green’s Theorem in the Plane (Sections: 10.1, 10.2, 10.3, 10.4).

Unit 2
Surface Integral: Surfaces for Surface Integrals, Surface Integrals, Triple Integrals – Gauss Divergence Theorem, Stoke’s Theorem. (Sections: 10.5, 10.6, 10.7, 10.9)

First Order Differential Equations: First Order ODE, Exact Differential Equations and Integrating Factors (Sections 1.1 and 1.4).

Unit 3
Second Order Differential Equations: Homogeneous and non-homogeneous linear differential equations of second order (Review), Modelling: Free Oscillations, Euler-Cauchy Equations, Solution by Undetermined Coefficients, Solution by the Method of Variation of Parameters (Sections 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 2.10).


TEXTBOOK:
SYLLABI

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Unit 2

Unit 3
Numerical Integration and Differentiation. (Sections: 19.1-19.5)


**REFERENCE BOOK:**

**15MAT214** PROBABILITY AND STATISTICS 2 1 0 3

Unit 1

Unit 2
Sampling Distributions: Distributions of Sampling Statistics, Chi-square, t and F distributions (only definitions and use). Central Limit Theorem.

Unit 3
Testing of Hypothesis: Large and small sample tests for mean and variance – Tests based on Chi-square distribution.

**TEXTBOOK:**

**15MEC100** ENGINEER IN GDRAWING - CAD 2 0 2 3


**REFERENCES:**

**15MEC180** WORKSHOP A 0 0 2 1

1. Product Detailing Workshop
Disassemble the product of sub assembly - Measure various dimensions using measuring instruments - Free hand rough sketch of the assembly and components - Name of the components and indicate the various materials used - Study the functioning of the assembly and parts - Study the assembly and components design for compactness, processing, ease of assembly and disassembly - Assemble the product or subassembly.

2. Pneumatics and PLC Workshop
Study of pneumatic elements - Design and assembly of simple circuits using basic

3. Sheet Metal Workshop
Study of tools and equipments - Draw development drawing of simple objects on sheet metal (cone, cylinder, pyramid, prism, tray etc.) Fabrication of components using small shearing and bending machines - Riveting and painting practice.

4. (a) Welding Workshop
Study of tools and equipments - Study of various welding methods - Arc welding practice and demonstration of gas welding and cutting.

(b) Demo and practice Workshop
Fitting: Study of tools, practice in chipping, filing and making joints.
Carpentry: Study of tools, planning practice and making joints.

REFERENCE:
Concerned Workshop Manual

15PHY100 PHYSICS 3 0 0 3

Unit 1 Review of Classical Physics and dual nature of Waves / particle


Unit 2 Atomic Structure and Quantum Mechanics

Quantum Mechanics: Introduction - wave equation - Schrodinger’s equation (time dependent and independent) - expectation values, operators, Eigen value (momentum and energy) – 1D potential box (finite and infinite) - tunnel effect - harmonic oscillator.

Unit 3 Statistical Mechanics and Solid State Physics


TEXTBOOK:

REFERENCE BOOK:
“Principles of Physics” by Halliday, Resnick and Walker, 9th edition

15PHY181 PHYSICS LAB. 0 0 2 1

Young’s Modulus – Non Uniform Bending
Newton’s Rings
Laser - Determination of Wavelength and Particle Size Determination
Spectrometer
Carey Foster’s Bridge
Rigidity Modulus - Tensional Pendulum
Viscosity of Liquid by Stokes’s method
Ultrasonic Interferometer
Hysteresis – B H curve

15PHY230 ADVANCED CLASSICAL DYNAMICS 3 0 0 3

Unit 1
Introduction to Lagrangian dynamics
Survey of principles, mechanics of particles, mechanics of system of particles, constraints, D’Alembert’s principle and Lagrange's equation, simple applications of the Lagrangian formulation, variational principles and Lagrange’s equations, Hamilton's principles, derivation of Lagrange’s equations from Hamilton's principle, conservation theorems and symmetry properties.

Unit 2
Central field problem
Two body central force problem, reduction to the equivalent one body problem, Kepler problem, inverse square law of force, motion in time in Kepler’s problem, scattering in central force field, transformation of the scattering to laboratory system, Rutherford scattering, the three body problem.
1. Rotational kinematics and dynamics
   Kinematics of rigid body motion, orthogonal transformation, Euler's theorem on the motion of a rigid body.

Unit 3
Angular momentum and kinetic energy of motion about a point, Euler equations of motion, force free motion of rigid body.

Practical rigid body problems
Heavy symmetrical spinning top, satellite dynamics, torque-free motion, stability of torque-free motion - dual-spin spacecraft, satellite maneuvering and attitude control - coning maneuver - Yo-yo despin mechanism - gyroscopic attitude control, gravity-gradient stabilization.

TEXTBOOKS:

REFERENCE BOOKS:

15PHY233 BIOPHYSICS AND BIOMATERIALS 3 0 0 3

OBJECTIVE: To equip the students with the knowledge on different kinds of biomaterials and other medical need, basic research, and to provide an overview of theory and practice of bio materials.

Unit 1

Definition and classification of bio-materials, mechanical properties, visco-elasticity, wound-healing process, Application of biomaterial for the human body, body response to implants, blood compatibility. Implementation problems - inflammation, rejection, corrosion, structural failure. Surface modifications for improved compatibility.
Unit 3

Eigen values and Eigen vectors of matrix: Determinant of a matrix, characteristic equation of a matrix, eigen values and eigen vectors of a matrix, power method.

TEXTBOOK:
Rubin H Landau & Manuel Jose Paez Mejia, “Computational Physics”, John Wiley & Sons
Suresh Chandra, “Computer Applications in Physics”, Narosa Publishing House, New Delhi
M Hijroth Jensen, Department of Physics, University of Oslo, 2003 (Available in the Web)

15PHY238 ELECTRICAL ENGINEERING MATERIALS 3 0 0 3

Unit 1
Conducting materials: The nature of chemical bond, crystal structure Ohm’s law and the relaxation time, collision time, electron scattering and resistivity of metals, heat developed in a current carrying conductor, thermal conductivity of metals, superconductivity.

Semiconducting materials: Classifying materials as semiconductors, chemical bonds in Si and Ge and it’s consequences, density of carriers in intrinsic semiconductors, conductivity of intrinsic semiconductors, carrier densities in n type semiconductors, n type semiconductors, Hall effect and carrier density.

Unit 2
Magnetic materials: Classification of magnetic materials, diamagnetism, origin of permanent, magnetic dipoles in matter, paramagnetic spin systems, spontaneous magnetization and Curie Weiss law, ferromagnetic domains and coercive force, anti ferromagnetic materials, ferrites and it’s applications.

Unit 3
Dielectric materials: Static dielectric constant, polarization and dielectric constant, internal field in solids and liquids, spontaneous polarization, piezoelectricity.

PN junction: Drift currents and diffusion currents, continuity equation for minority carriers, quantitative treatment of the p-n junction rectifier, the n-p-n transistor.

TEXTBOOK:

15PHY239 ELECTROMAGNETIC FIELDS AND WAVES 3 0 0 3

Unit 1
Electrostatics: Coulombs law and electric field intensity, field due to a continuous volume charge distribution, field of a line charge, field of sheet of charge, electric flux density, Gauss’s law, application of Gauss’s law, Maxwell’s first equation.

Poisson’s and Laplace’s equations: The potential field of a point charge, potential field of a system of charges: conservative property, potential gradient, the dipole.

Unit 2
Poisson’s and Laplace’s equations, uniqueness theorem, examples of the solution of Laplace’s equation, solution of Poisson’s equation.

Electromagnetics: Biot Savart law, magnetic flux and magnetic flux density, scalar and vector magnetic potentials, derivation of steady magnetic field laws, Faraday’s laws, displacement current, Maxwell’s equations in point and integral form, retarded potentials.

Unit 3
Electromagnetic waves: EM wave motion in free space, wave motion in perfect dielectrics, plane wave in lossy dielectrics, Poynting vector and power consideration, skin effect, reflection of uniform plane waves, standing wave ratio.

Transmission line equations, line parameters - examples, dipole radiation, retarded potentials, electric dipole radiation.

TEXTBOOK:

REFERENCES:
15PHY240  ELECTRONIC MATERIALS SCIENCE  3 0 0 3

Unit 1
Types of bonding in solids, Crystallography and crystalline defects: Crystallography, Directions and planes, Crystalline defects, line defects, Planar defects, Volume defects; Binary and Ternary Phase Diagrams; Lever rule and phase rule, Eutectic, peritectic and Eutectoid systems, Applications of Phase diagrams; Basic Quantum Physics - atomic structure, Use of band theory and occupation statistics to explain existence and basic properties of metals and nonmetals. Working of Semiconductor Devices using band diagrams and their electrical characteristics: pn junctions, BJT, MOSFET.

Unit 2
Use of band theory to explain optoelectronic properties of materials and optoelectronic devices: LEDs, Solar Cells, Lasers, pin diodes, photodiodes; Magnetic properties and Superconductivity: Magnetic moments and Magnetic Permeability, types of magnetism, saturation magnetization, magnetic domains, soft and hard magnetic materials, superconductivity and its origin, Giant Magneto Resistance, Josephson effect, Energy band diagrams and Magnetism, Applications of magnetic materials - Magnetic recording materials, etc.

Unit 3

TEXTBOOK:

REFERENCE:

15PHY241  LASERS IN MATERIAL PROCESSING  3 0 0 3

Unit 1
Basic optical theory: Nature of electromagnetic radiation, interaction of radiation with matter, reflection, refraction, polarization, laser fundamentals, laser beam characteristics, beam quality (laser cavity modes), Q-switching, mode locking, continuous wave, types of lasers, energy and power.

Laser interaction with materials: Optical properties of materials, laser interaction with metals, insulators, semiconductors, polymers and biological materials.

REFERENCES:

15PHY243  MICROELECTRONIC FABRICATION  3 0 0 3

Unit 1
Introduction to semiconductor fabrication – scaling trends of semiconductor devices; crystal structure of semiconductor materials, crystal defects, phase diagrams and
solid solubility; physics of Czochralski growth of single crystal silicon, Bridgeman method for GaAs, float zone process; diffusion science: Ficks laws of diffusion, atomistic models of diffusion, dopant diffusion mechanisms; kinetics of thermal oxidation, Deal-Grove Model, nitridation of silicon, structure and characteristics of oxides, effect of dopants on oxidation kinetics, dopant redistribution;

Unit 2
Physics of ion implantation: Coulombic scattering and projected range, nuclear and electronic stopping, channeling, implantation damage removal, dopant activation by rapid thermal annealing; principles of optical lithography – optics and diffraction, light sources and spatial coherence, physics of pattern transfer, nodulation transfer function; chemistry of lithographic processes: organic and polymeric photoresists, developing and exposure, contrast; principles of non-optical lithography: electron beam, X-ray lithography, resists, sources; etching: Chemistry of wet etching, plasma physics, chemistry of plasma etching and reactive ion etching; chemical mechanical polishing.

Unit 3
Vacuum science: Kinetic theory of gases, gas flow and conductance, vacuum pumps and seals; deposition of thin films: physics of sputtering and evaporation, step coverage and morphology of deposited films, chemical vapor deposition; chemical equilibrium and law of mass action, gas flow and boundary layers, types of CVD, plasma assisted CVD; thermodynamics of epitaxial growth, types molecular beam epitaxy, isolation and contact formation – LOCOS and trench, silicides, metallization with Al and Cu; process Integration: CMOS, bipolar process flow.

TEXTBOOK:
Stephen Campbell, Science and Engineering of Microelectronic Fabrication, Oxford University Press, 2001

REFERENCES:

15PHY247 NUCLEAR ENERGY: PRINCIPLES AND APPLICATIONS 3 0 0 3

Unit 1
Introduction to semiconductors: Semiconductors: concept of electron and holes, conduction in semiconductors and concentration of charge carriers in semiconductors. Direct and indirect band gap semiconductors (quantum mechanical treatment). Extrinsic semiconductors: n-type, p-type & compensation doping, carrier concentration; PN junction - concept of bands at PN junction, junction under forward and reverse biases (conceptual).

Unit 2
Syllabi

B. Tech - Civil Engg.

2015 admissions onwards


Unit 3

Advanced Solar cell technologies (III Generation): Alternatives to conventional Si based solar cells - Thin film solar cells, Hetero junction solar cells, Tandem solar cells: material properties, fabrication and stability (includes nano scale devices). Organic solar cells.

Textbook:

References:

15PHY248 PHYSICS OF LASERS AND APPLICATIONS 3 0 0 3

Unit 1
Review of some basic concepts and principle of laser.


Unit 2
Properties of LASERS
Gain mechanism, threshold condition for PI (derivation), emission broadening - line width, derivation of FWHM natural emission line width as deduced by quantum mechanics - additional broadening process: collision broadening, broadening due to dephasing collision, amorphous crystal broadening, Doppler broadening in laser and broadening in gases due to isotope shifts. Saturation intensity of laser, condition to attain saturation intensity.

Properties – coherency, intensity, directionality, monochromaticity and focussibility. LASER transition – role of electrons in LASER transition, levels of LASER action: 2 level, 3 level and 4 level laser system.

Unit 3
Types of LASERS

Liquid chemical and dye LASERS. Semiconductor LASER: Principle, characteristics, semiconductor diode LASERS, homo-junction and hetero-junction LASERS, high power semi conductor diode LASERS.

Applications in Communication field:
LASER communications: Principle, construction, types, modes of propagation, degradation of signal, analogue communication system, digital transmission, fiber optic communication.

Applications of LASERS in other fields:

References:

15PHY250 QUANTUM PHYSICS AND APPLICATIONS 3 0 0 3

Unit 1
Unit 2
Bosons and Fermions - symmetric and antisymmetric wavefunctions - elements of statistical physics: density of states, fermi energy, Bose condensation - solid state physics: Free electron model of metals, elementary discussion of band theory and applications to semiconductor devices.

Einstein coefficients and light amplification - stimulated emission - optical pumping and laser action.

Unit 3

Nuclear physics: nuclear properties - binding energy and mass formula - nuclear decay with applications - theory of alpha decay - nuclear forces – fission - principle of nuclear reactor - elementary particles - leptons, hadrons, quarks, field bosons - the standard model of elementary particles.

TEXTBOOK:
A Beiser, Perspectives in Modern Physics, McGraw Hill

REFERENCES:

15PHY251
THIN FILM PHYSICS

Unit 1

Defects in thin film: General concepts, nature of defect, microscopic defect and dislocation. Boundary defects. Defect and energy states - donar acceptor levels, trap and recombination centers, excitons, phonons.

Unit 2

15PHY331
ASTRONOMY

Unit 1

Unit 2
Observational Astronomy
Observing the Universe - The classic Newtonian telescope - The Cassegrain telescope - Cataloptric telescopes - The Schmidt camera - The Schmidt–Cassegrain telescope - The Maksutov–Cassegrain telescope - Active and adaptive optics -
Some significant optical telescopes - Gemini North and South telescopes - The Keck telescopes - The South Africa Large Telescope (SALT) - The Very Large Telescope (VLT) - The Hubble Space Telescope (HST) - The future of optical astronomy - Radio telescopes - The feed and low noise amplifier system - Radio receivers - Telescope designs - Large fixed dishes - Telescope arrays - Very Long Baseline Interferometry (VLBI) - The future of radio astronomy - Observing in other wavebands – Infrared – Sub-millimetre wavelengths - The Spitzer space telescope - Ultraviolet, X-ray and gamma-ray observatories - Observing the universe without using electromagnetic radiation - Cosmic rays - Gravitational waves.

Unit 3

TEXTBOOK:
Introduction to Astronomy and Cosmology, Ian Morison, Wiley (UK), 2008

REFERENCE BOOK:
Institute of Physics Publishing

15PHY333
CONCEPTS OF NANOPHYSICS AND NANOTECHNOLOGY 3 0 0 3

Unit 1
Introduction
Introduction to nanotechnology, comparison of bulk and nanomaterials – change in band gap and large surface to volume ratio, classification of nanostructured materials. Synthesis of nanomaterials - classification of fabrication methods - top down and bottom up methods.
resolution – contrast X-ray imaging - fluoroscopy modes of operation - image quality - fluoroscopy suites - radiation dose – computed-aided tomography (CAT).

Unit 2
Nuclear medicine - principles of nuclear physics – natural radioactivity, decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles; Nuclear Isomerism, internal conversion - ideal energy for radiotherapy based on interactions. Radionuclide used in medicine - radionuclide production – dosimetry - safety - radiation hazards – PET.

Nuclear magnetic resonance physics - magnetic moment – magnetization – relaxation - nuclear magnetic resonance spectroscopy.

Unit 3
Nuclear magnetic resonance imaging (MRI) – principle - chemical shift - magnetic resonance signal induction and relaxation - pulse sequencing and spatial encoding.


TEXTBOOK:

REFERENCE BOOKS:
1. Glasser. O. Medical Physics Vol.1, 2, 3 Book Publisher Inc Chicago, 1980

15PHY338 PHYSICS OF SEMICONDUCTOR DEVICES  3 0 0  3

Unit 1
Introduction: Unit cell, Bravais lattices, crystal systems, crystal planes and Miller indices, symmetry elements. Defects and imperfections – point defects, line defects, surface defects and volume defects.


Unit 2

Theory of p-n junctions – diode and transistor: p-n junction under thermal equilibrium, forward bias, reverse bias, carrier density, current, electric field, barrier potential. V-I characteristics, junction capacitance and voltage breakdown.

Unit 3


Modern semiconducting devices: CCD - introduction to nano devices, fundamentals of tunneling devices, design considerations, physics of tunneling devices.

TEXTBOOKS:

REFERENCES:

15PHY532 ASTROPHYSICS  3 0 0  3

Unit 1

Practical astronomy - telescopes and observations & techniques – constellations, celestial coordinates, ephemeris.

Celestial mechanics - Kepler’s laws - and derivations from Newton’s laws.
SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

Sun: Structure and various layers, sunspots, flares, faculae, granules, limb darkening, solar wind and climate.

Unit 2

Variable stars: Cepheid, RR Lyrae and Mira type variables - Novae and Super novae. Binary and multiple star system - measurement of relative masses and velocities. Interstellar clouds - Nebulae.

Unit 3
Galactic astronomy: Distance measurement - red shifts and Hubble’s law – age of the universe, galaxies – morphology - Hubble’s classification - gravitational lens, active galactic nuclei (AGNs), pulsars, quasars.


Cosmology: Comic principles, big bang and big crunch – cosmic background radiation - Nucleo-synthesis - plank length and time, different cosmic models - inflationary, steady state. Variation of G. anthropic principle.

REFERENCES:
5. ‘Stellar Astronomy’ by K. D Abhayankar.

15PHY535 EARTH’S ATMOSPHERE 3 0 0 3

Unit 1
Earth’s atmosphere: overview and vertical structure. Warming the earth and the atmosphere: temperature and heat transfer; absorption, emission, and equilibrium; incoming solar energy. Air temperature: daily variations, controls, data, human comfort, measurement. Humidity, condensation, and clouds: circulation of water in the atmosphere; evaporation, condensation, and saturation; dew and frost; fog.

SYLLABI

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Unit 2

Unit 3
Air masses, fronts, and mid-latitude cyclones. Weather forecasting: acquisition of weather information, forecasting methods and tools, forecasting using surface charts. Thunderstorms: ordinary (air-mass) thunderstorms, mesoscale convective complexes, floods and flash floods, distribution of thunderstorms, lightning and thunder. Tornadoes: severe weather and Doppler radar, waterspouts.

Unit 4
Hurricanes (cyclones, typhoons): tropical weather; anatomy, formation, dissipation and naming of hurricanes. Air pollution: a brief history, types and sources, factors that affect air pollution, the urban environment, acid deposition. Global climate: climatic classification; global pattern of climate.

Unit 5
Climate change: possible causes; carbon dioxide, the greenhouse effect, and recent global warming. Light, colour, and atmospheric optics: white and colours, white clouds and scattered light; blue skies and hazy days, red suns and blue moons; twinkling, twilight, and the green flash; the mirage; halos, sundogs, and sun pillars; rainbows; coronas and cloud iridescence.

TEXTBOOK:

REFERENCE:

15PHY536 EARTH’S STRUCTURE AND EVOLUTION 3 0 0 3

Unit 1
Introduction: geologic time; earth as a system, the rock cycle, early evolution, internal structure & face of earth, dynamic earth. Matter and minerals: atoms, isotopes and radioactive decay; physical properties & groups of minerals; silicates,
important non-silicate minerals, resources. Igneous rocks: magma, igneous processes, compositions & textures; naming igneous rocks; origin and evolution of magma, intrusive igneous activity, mineral resources and igneous processes.

Unit 2
Volcanoes and volcanic hazards: materials extruded, structures and eruptive styles, composite cones and other volcanic landforms, plate tectonics and volcanic activity. Weathering and soils: earth’s external processes: mechanical & chemical weathering, rates; soils, controls of formation, profile, classification, human impact, erosion, weathering and ore deposits. Sedimentary rocks: the importance and origins of sedimentary rocks; detrital & chemical sedimentary rocks, coal, converting sediment into sedimentary rock; classification & structures, nonmetallic mineral & energy resources. Metamorphism and metamorphic rocks: metamorphic textures, common metamorphic rocks, metamorphic environments & zones.

Unit 3

Unit 4
Shorelines: coastal zone, waves & erosion, sand movement, shoreline features & stabilization; erosion problems along U.S. coasts, hurricanes, coastal classification, tides. Earthquakes and earth's interior: faults, seismology, locating the source of an earthquake, measuring intensity, belts and plate boundaries, destruction, damage east of the Rocky Mountains, earthquake prediction, earth's interior. Plate tectonics: continental drift, divergent boundaries, convergent boundaries, transform fault boundaries, testing the plate tectonics model, the breakup of Pangaea, measuring plate motion, what drives plate motions, plate tectonics in the future.

Unit 5
Origin and evolution of the ocean floor: continental margins, features of deep-ocean basins, anatomy of oceanic ridge, oceanic ridges and seafloor spreading, nature of oceanic crust, continental rifting, destruction of oceanic lithosphere. Crustal deformation and mountain building: structures formed by ductile & brittle deformation, mountain building at subduction zones, collisional mountain belts, fault-block mountains, vertical movements of the crust. Geologic time: time scales, relative dating, correlation of rock layers; dating with radioactivity, the geologic time scale, difficulties in dating. Earth's evolution: birth of a planet, origin of the atmosphere and oceans, Precambrian (formation of continents); Phanerozoic (formation of modern continents & earth's first life); Paleozoic (life explodes); the Mesozoic (dinosaurs); Cenozoic era (mammals). Global climate change: climate & geology, climate system, detecting change; atmospheric basics & heating the atmosphere; natural & human causes; carbon dioxide, trace gases, and climate change; climate-feedback mechanisms, aerosols, some possible consequences.

TEXTBOOK:

REFERENCE:
Bifurcations: in one-dimensional maps and flows, Hopf bifurcations, homoclinic and heteroclinic bifurcations, crises.

Hamiltonian chaos: Hamilton’s equations and properties of Hamiltonian systems, examples, three-dimensional conservative flows, symplectic maps.

**Unit 3**

Time-series properties: examples, conventional linear methods, a case study, time-delay embeddings.

Nonlinear prediction and noise-reduction: linear predictors, state-space prediction, noise reduction, Lyapunov exponents from experimental data, false nearest neighbours.

Fractals: Cantor sets, curves, trees, gaskets, sponges, landscapes.

Calculations of fractal dimension: similarity, capacity and correlation dimensions, entropy, BDS statistic, minimum mutual information, practical considerations.

Fractal measure and multifractals: convergence of the correlation dimension, multifractals, examples and numerical calculation of generalized dimensions.

Non-chaotic fractal sets: affine transformations, iterated functions systems, Mandelbrot and Julia sets.

Spatiotemporal chaos and complexity: examples, cellular automata, coupled map lattices, self-organized criticality.

**TEXTBOOK:**


**REFERENCES:**


**15PHY542  OPTOELECTRONIC DEVICES  3 0 0 3**

**Unit 1**


Basics of semiconductor optics: Dual nature of light, band structure of various semiconductors, light absorption and emission, photoluminescence, electroluminescence, radioactive and non-radiative recombination, wave trains.

**Unit 2**

Semiconductor light-emitting diodes: Structure and types of LEDs and their characteristics, guided waves and optical modes, optical gain, confinement factor, internal and external efficiency, semiconductor heterojunctions, double-heterostructure LEDs.

Semiconductor lasers: Spontaneous and stimulated emission, principles of a laser diode, threshold current, effect of temperature, design of an edge-emitting diode, emission spectrum of a laser diode, quantum wells, quantum-well laser diodes.

**Unit 3**

Semiconductor light modulators: Modulating light (direct modulation of laser diodes, electro-optic modulation, acousto-optic modulation), isolating light (magneto-optic isolators), inducing optical nonlinearity (frequency conversion, switching)

Semiconductor light detectors: I-V characteristics of a p-n diode under illumination, photovoltaic and photoconductive modes, load line, photocells and photodiodes, p-i-n photodiodes, resistivity, noise and sensitivity, photodiode materials, electric circuits with photodiodes, solar cells.

**REFERENCES:**

SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards

Unit 2
Verbs- Singular, Dual and plural – First person, Second person, Third person.
Tenses – Past, Present and Future – Atmanepadi and Parasmaipadi - karthariprayoga

Unit 3
Words for communication, slokas, moral stories, subhashithas, riddles (from the books prescribed)

Unit 4
Selected slokas from Valmiki Ramayana, Kalidasa’s works and Bhagavad Gita.
Ramayana – chapter VIII - verse 5, Mahabharata - chapter 174, verse -16, Bhagavad Gita – chapter - IV verse 8, Kalidasa’s Sakuntalam Act IV – verse 4

Unit 5
Translation of simple sentences from Sanskrit to English and vice versa.

ESSENTIAL READING:
1. Praveshaha; Publisher: Samskrita bharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore - 560 085
2. Sanskrit Reader I, II and III, R. S. Vadhyar and Sons, Kalpathi, Palakkad
3. Prakriya Bhashyam written and published by Fr. John Kunnappally
4. Sanskrit Primer by Edward Delavan Perry, published by Ginn and Company Boston
5. Sabdamanjari, R. S. Vadyar and Sons, Kalpathi, Palakkad
6. Namalinganusasanam by Amarasimha published by Travancore Sanskrit series
7. Subhashita Ratna Bhandakara by Kashinath Sharma, published by Nirmayasagar press

15SAN111

SANSKRIT II

OBJECTIVES: To familiarize students with Sanskrit language and literature; to enable them to read and understand Sanskrit verses and sentences; to help them acquire expertise for self-study of Sanskrit texts and communication in Sanskrit; to help the students imbibe values of life and Indian culture as propounded in scriptures.

Unit 1
Seven cases, indeclinables, sentence making with indeclinables, Saptha karakas.

ESSENTIAL READING:
1. Praveshaha; Publisher: Samskrita bharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore - 560 085
2. Sanskrit Reader I, II and III, R. S. Vadhyar and Sons, Kalpathi, Palakkad
3. Prakriya Bhashyam written and published by Fr. John Kunnappally
4. Sanskrit Primer by Edward Delavan Perry, published by Ginn and Company Boston
5. Sabdamanjari, R. S. Vadyar and Sons, Kalpathi, Palakkad
6. Namalinganusasanam by Amarasimha published by Travancore Sanskrit series
7. Subhashita Ratna Bhandakara by Kashinath Sharma, published by Nirmayasagar press

15SSK221

SOFT SKILLS I

Soft skills and its importance: Pleasure and pains of transition from an academic environment to work - environment. Need for change. Fears, stress and competition in the professional world. Importance of positive attitude, self motivation and continuous knowledge upgradation.

Self-confidence: Characteristics of the person perceived, characteristics of the situation, characteristics of the perceiver. Attitude, values, motivation, emotion management, steps to like yourself, positive mental attitude, assertiveness.

Presentations: Preparations, outlining, hints for efficient practice, last minute tasks, means of effective presentation, language, gestures, posture, facial expressions, professional attire.
Vocabulary building: A brief introduction into the methods and practices of learning vocabulary. Learning how to face questions on antonyms, synonyms, spelling error, analogy, etc. Faulty comparison, wrong form of words and confused words like understanding the nuances of spelling changes and wrong use of words. Listening skills: The importance of listening in communication and how to listen actively.

Prepositions, articles and punctuation: A experiential method of learning the uses of articles and prepositions in sentences is provided.

Problem solving level I: Number system; LCM & HCF; Divisibility test; Surds and indices; Logarithms; Ratio, proportions and variations; Partnership;

Problem solving level II: Time speed and distance; work time problems;

Data interpretation: Numerical data tables; Line graphs; Bar charts and Pie charts; Caselet forms; Mix diagrams; Geometrical diagrams and other forms of data representation.

Logical reasoning: Family tree; Deductions; Logical connectives; Binary logic; Linear arrangements; Circular and complex arrangement; Conditionalities and grouping; Sequencing and scheduling; Selections; Networks; Codes; Cubes; Venn diagram in logical reasoning; Quant based reasoning; Flaw detection; Puzzles; Cryptarithms.

TEXTBOOKS:
5. Quantitative Aptitude by R. S. Aggarwal,S. Chand
6. Quantitative Aptitude – Abijith Guha, TMH.
7. Quantitative Aptitude for Cat - Arun Sharma. TMH.
8. Quick Maths – Tyra.
9. Quicker Arithmetic – Ashish Aggarwal
10. Test of reasoning for competitive examinations by Thorpe.E. TMH
11. Non-verbal reasoning by R. S. Aggarwal, S. Chand

REFERENCES:
3. The BBC and British Council online resources
www.the grammarbook.com - online teaching resources
www.englishpage.com - online teaching resources and other useful websites.

15SSK321

Soft Skills II 1 0 2 2


Group discussions: Advantages of group discussions, structured GD – roles, negative roles to be avoided; personality traits to do well in a GD, initiation techniques, how to perform in a group discussion, summarization techniques.

Listening comprehension advanced: Exercise on improving listening skills, grammar basics: Topics like clauses, punctuation, capitalization, number agreement, pronouns, tenses etc.

Reading comprehension advanced: A course on how to approach middle level reading comprehension passages.

Problem solving level III: Money related problems; Mixtures; Symbol based problems; Clocks and calendars; Simple, linear, quadratic and polynomial equations; special equations; Inequalities; Functions and graphs; Sequence and series; Set theory; Permutations and combinations; Probability; Statistics.

Data sufficiency: Concepts and problem solving.

Non-verbal reasoning and simple engineering aptitude: Mirror image; Water image; Paper folding; Paper cutting; Grouping of figures; Figure formation and analysis; Completion of incomplete pattern; Figure matrix; Miscellaneous.

Spacial aptitude: Cloth, leather, 2D and 3D objects, coin, match sticks, stubs, chalk, chess board, land and geodesic problems etc., related problems.

TEXTBOOKS:
5. Quick Maths – Tyra.
6. Quicker Arithmetic – Ashish Aggarwal
7. Test of reasoning for competitive examinations by Thorpe.E. TMH
8. Non-verbal reasoning by R. S. Aggarwal, S. Chand
15SSK331  SOFT SKILLS III  1 0 2  2

Team work: Value of team work in organisations, definition of a team, why team, elements of leadership, disadvantages of a team, stages of team formation. Group development activities: Orientation, internal problem solving, growth and productivity, evaluation and control. Effective team building: Basics of team building, teamwork parameters, roles, empowerment, communication, effective team working, team effectiveness criteria, common characteristics of effective teams, factors affecting team effectiveness, personal characteristics of members, team structure, team process, team outcomes.

Facing an interview: Foundation in core subject, industry orientation / knowledge about the company, professional personality, communication skills, activities before interview, upon entering interview room, during the interview and at the end. Mock interviews.

Advanced grammar: Topics like parallel construction, dangling modifiers, active and passive voices, etc.

Syllogisms, critical reasoning: A course on verbal reasoning. Listening comprehension advanced: An exercise on improving listening skills.

Reading comprehension advanced: A course on how to approach advanced level of reading, comprehension passages. Exercises on competitive exam questions.

Problem solving level IV: Geometry; Trigonometry; Heights and distances; Coordinate geometry; Mensuration.

Specific training: Solving campus recruitment papers, national level and state level competitive examination papers; Speed mathematics; Tackling aptitude problems asked in interview; Techniques to remember (In mathematics), Lateral thinking problems. Quick checking of answers techniques; Techniques on elimination of options, estimating and predicting correct answer; Time management in aptitude tests; Test taking strategies.

REFERENCES:
3. The BBC and British Council online resources
4. Owl Purdue University online teaching resources www.englishpage.com- online teaching resources and other useful websites.

15SWK230  CORPORATE SOCIAL RESPONSIBILITY  2 0 0  2

Unit 1
Understanding CSR - Evolution, importance, relevance and justification. CSR in the Indian context, corporate strategy. CSR and Indian corporate. Structure of CSR - In the Companies Act 2013 (Section 135); Rules under Section 13; CSR activities, CSR committees, CSR policy, CSR expenditure CSR reporting.

Unit 2
CSR Practices & Policies - CSR practices in domestic and international area; Role and contributions of voluntary organizations to CSR initiatives. Policies; Preparation of CSR policy and process of policy formulation; Government expectations, roles and responsibilities. Role of implementation agency in Section 135 of the Companies Act, 2013. Effective CSR implementation.

Unit 3
Project Management in CSR initiatives - Project and programme; Monitoring and evaluation of CSR Interventions. Reporting - CSR Documentation and report writing. Reporting framework, format and procedure.

REFERENCES:
SYLLABI

B. Tech - Civil Engg. 2015 admissions onwards


15SWK231 WORKPLACE MENTAL HEALTH 2002

Unit 1

Unit 2

Unit 3
Strategies of Help and Care: Positive impact of work on health, Characteristics of mentally healthy workplace, Employee and employer obligations, Promoting mental health and well being - corporate social responsibility (CSR), an inclusive work environment, Training and awareness raising, managing performance, inclusive recruitment, Supporting individuals talking about mental health, making reasonable adjustments, Resources and support for employees - Employee Assistance Programme / Provider (EAP), in house counsellor, medical practitioners, online resources and telephone support, 24 hour crisis support, assistance for colleagues and care givers, Legislations. Case Study, Activity.

REFERENCES:
3. Canadian Mental Health Association, Ontario "Workplace mental health promotion, A how to guide"wmhp.cmhaontario.ca/
**SYLLABI**

**B. Tech - Civil Engg.**

2015 admissions onwards

<table>
<thead>
<tr>
<th>Unit 5</th>
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</thead>
<tbody>
<tr>
<td>Tamil Grammar: Col vakaika - vēṟṟumai urupukal - vallīṟam mukumțam mīkāyṟam - canti(pūṟarci) - ilakkaṟatukkuṟṟippu.</td>
</tr>
<tr>
<td>Practical skills: Listening, speaking, writing and reading</td>
</tr>
</tbody>
</table>

**Textbooks:**

- Aṉṟā “ēḻṟṟa tamīṟkamē” nakkēṟṟa pūḻṟēṟṟēṟṟēarat.
- Cakīṟoṟcant cupramoṟṟoro “nalla hūṟṟuntokai mūṟumumuraiyum” moolai putippakam 7008
- pūḻṟēṟṟēṟṟēṟṟērat “kūṟṟuntokai mūṟumum uraiyum” cūṟṟa putippakam, 2010. |
- Pūḻṟēṟṟēṟṟēṟṟērat “puttanṟṟēṟṟucc” sṛṟēṟṟuṟṟakai putippakam, 2010 |

**ISTAM111 TAMIL I I **

| 1 0 2 2 |

**Objectives:** To learn the history of Tamil literature. To analyze different styles, language training, to strengthen the creativity in communication, Tamil basic grammar, Computer and its use in Tamil language.

**Unit 1**

**Unit 2**
Tiṟṟai ilakkaṟṟumum nūṟṟivilakkivum - paṟṟinēṟṟikkaṟṟakkku nūṟṟal toṭarppāṇa nīṟa ceṟṟitkai tiṟṟukkuṟṟērat (aṟṟippu, paṟṟippu, kalvi, oḷḷakkam, naṟṟpu, vāṟṟmai, kēṟvi, oeymaṟṟērat, periyaraiṟṟatukkuṟṟippu, vilippurarpuṟṟu pēṟṟa atikarattil uḷḷa ceṟṟitkai.