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, Satyakama Jabala, 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 lead 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

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 - equilibrium and steady state approximations - 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, Nerst 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.

REFERENCE BOOKS
Physical chemistry, Puri and Sharma
Inorganic chemistry, Puri and Sharma
15CHY181 CHEMISTRY LAB. 0 0 2 1

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

15CHY231 ADVANCED POLYMER CHEMISTRY 3 0 0 3

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

TEXTBOOKS:

REFERENCES:
3. Jayadev Sreedhar and Govaniker, "Polymer Chemistry".

15CHY232 BIOMATERIALS SCIENCE 3 0 0 3

Unit 1
Introduction: Bulk properties, Surface properties and characterization - polymers, silicone biomaterials, medical fibres and biotextiles - Smart polymers - biorecomputable and bioerodible 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

Unit 3

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.
SYLLABI


Catalysis in solutions: Acid-base catalysis - catalysis in the gas phase, catalysis in dilute aqueous solution, catalysis in concentrated 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 polymers: Attachment of catalytic groups to polymer supports, Adsorption and the kinetics of polymer-catalyzed reactions.

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:

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: polyacetylene, polyacrylamine, polythiophene, poly (p-phenylenedivinylene) - ionically conducting polymers - applications of conjugated polymers. Semi-conducting, poly ferrocene - photo resist optical fibers and sensors, photo chromic & thermo chronic materials.


High energy materials: Preparation, properties and application of ammonium nitrate (AN), NH4NO3, ammonium perchlorate (AP), NH4ClO4, ammonium nitramide (AND), NH4(NO2)2, hydrazinium nitroformate (HNF), N2H5C(NO2)3 etc.

TEXTBOOKS:

REFERENCES:

CHEMISTRY OF ENGINEERING MATERIALS 3 0 0 3

Unit 1
Chemical materials in Electronics and Electrical Engineering: Structural correlation to behavior of conducting polymers, Semi-conducting polymers - properties of organic polymers containing metal groups such as poly ferrocene - optical fibers - definition, principle and structure - characteristics of optical fibre - photo resist optical fibre - advantages of optical fibre - liquid crystalline - peizo and pyroelectric polymers - magnetic materials, hard and soft magnets – sensors (voltametric).

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, barium, bismuth, selenium, zinc, thallium - Pesticides - Food poisoning - Drug poisoning - barbiturates - narcotics - ergot - LSD - alkaloids - Radioactive Toxicology - Radiation hazards.

TEXTBOOK:

REFERENCES:

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. Synthesis of Nanomaterials: Synthetic approaches: Colloidal Self-Assembly (Self-assembled monolayers - SAMs) and electrostatic self-assembly, electrochemical methods, sol-gel deposition.

Unit 2
Langmuir-Blodgett (LB) technique, chemical vapour deposition, plasma arcing and ball milling.

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 Toxican - 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.


TEXTBOOK:

REFERENCES:

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

15CHY239 COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING 3 0 0 3

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 - 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:
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:**

**15CHY242 ENVIRONMENTAL CHEMISTRY 3 0 0 3**

**Unit 1**
Air and air pollution (earth’s atmosphere): Regions - ozone - CFC and other chemicals - catalytic decomposition of ozone - ‘ozone hole’ formation - Air pollution due to gas emission from industries - Atmospheric aerosols – dust, combustion products, aerosol concentration and lifetimes - Automobile exhausts, smog and effects - Acid rain - chemistry of acid rain, roll of meteorology, greenhouse gases and global warming - air pollution due to jet engines.


**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, flue 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.

TEXTBOOK:

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 fuel stock.

Unit 2
Greener strategies of the synthesis of ibuprofen synthesis, teriphthalic 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; Blakwell Publishing.

15CHY245    INSTRUMENTAL METHODS OF ANALYSIS    3 0 0 3

Unit 1

Separation Techniques: Brief out line 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:

MEDICINAL ORGANIC CHEMISTRY 3 0 0 3

Unit 1

Physicochemical properties in relation to biological action: solubility, partition coefficient, dissociation constant, hydrogen bonding, ionization, drug shape, surface activity, complexation, protein binding, molar refractivity, bioisosterism - Stereo chemical aspects of drug action-stereo isomerism-optical isomerism.

Unit 2
Enzymes and hormones: Enzymes - nomenclature, classification and characteristics of enzymes - mechanism of enzyme action, factors affecting enzyme action, cofactors and co-enzymes, enzyme inhibition, enzymes in organic synthesis. Hormones and vitamins - representative cases.

MODERN POLYMER COMPOSITES 3 0 0 3

Unit 1

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

15CHY248 ORGANIC REACTION MECHANISMS 3 0 0 3

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 - Favoranskii 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 - carbenes and benzynes - Baeyer-Villeger reactions - Dienophen-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 - SN 1 reaction - radical ions - Birch reduction - Hofmann-Loeffler-Freytag reaction - Barton reaction - McMurry reaction.


TEXTBOOK:

REFERENCES:

15CHY249 ORGANIC SYNTHESIS AND STEREOCHEMISTRY 3 0 0 3

Unit 1
Nomenclature of Organic compounds: Polyenes, 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.

TEXTBOOKS:

REFERENCES:

15CHY250 POLYMER MATERIALS AND PROPERTIES 3 0 0 3

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, polyacetal, PET, PBT, PTFE, High performance polymer - PES, PEI, 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:

REFERENCE BOOKS:

15CHY251 POLYMERS FOR ELECTRONICS 3 0 0 3

Unit 1

Unit 2
Photoconductive polymers: Charge carriers, charge injectors, charge transport, charge trapping. Polymers for optical data storage - principles of optical storage, polymers in recording layer.

Nonlinear optics: NLO properties and NLO effects, wave guide devices, polymer optical fibers - through plane modulators.

Unit 3

Liquid crystalline polymers: Fundamentals and process, liquid crystalline displays - Applications.

TEXTBOOK:

REFERENCES:

15CHY252 SOLID STATE CHEMISTRY 3 0 0 3

Unit 1
defect - schottky and frenkel defects - Non-stoichiometric defects - metal excess and metal deficiency defects, influence of defects on the properties of solids.

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

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 batteries; Lithium primary cells - liquid cathode, solid cathode and lithium-ferrous sulphide cells (comparative account).

Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells (comparative account). Advanced Batteries for electric vehicles, requirements of the battery - sodium-beta and redox batteries.

Unit 3
Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells.

Membranes for fuel cells: Nafion – Polymer blends and composite membranes; assessment of performance – recent developments.


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:

REFERENCES:

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:

15CSE313 SOFTWARE ENGINEERING 2 0 2 3

Unit 1

Unit 2

Unit 3

REFERENCES:
15CSE374 INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS

**Unit 1**

**Unit 2**

**Unit 3**

**TEXTBOOKS:**

**REFERENCES:**

15CUL101 CULTURAL EDUCATION I

**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)

15CUL111 CULTURAL EDUCATION II

**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

**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.

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)
5. Message of Upanishads, by Swami Ranaganathananda published by Bharatiya Vidyabhavan, Bombay;


7. Art of Man Making - Swami Chinmayananda published by Chinmay Mission, Bombay
8. Will Power and its Development- Swami Budhananda published by Advaitha Ashram, Kolliatt
10. Yoga In Daily Life - Swami Sivananda – published by Divine Life Society
12. All about Hinduism – Swami Sivananda - Published by Divine Life Society
13. The Mind and Its Control by Swami Budhananda published by Advaitha Ashram, Kolliatt
15. ValmikiRamayana – Four volumes- published by Parimal Publications, Delhi
17. Mind Sound Resonance Technique (MSRT) Published by Swami Vivekananda Yoga Prakashana, Bangalore.
18. Yoga & Memory - Dr H R Nagendra & Dr. Shirley Telles, published by Swami Vivekananda Yoga Prakashana, Bangalore.


15CUL231  EXCELLENCE IN DAILY LIFE  2 0 0 2

Unit 1
1. The anatomy of 'Excellence'. What is 'excellence'? Is it judged by external factors like wealth?
2. The Great Flaw. The subject-object relationship between individual and world.
   Promote subject enhance excellence.
3. To work towards excellence, one must know where he is. Our present state...
   An introspective analysis. Our faculties within.

Unit 2
4. The play of the mind. Emotions – convert weakness into strength.
5. The indispensible role of the intellect. How to achieve and apply clear thinking?
7. Increase Productivity, reduce stress.. work patterning.

Unit 3
8. The art of right contact with the world. assessment, expectations.
9. Myths and Realities on key issues like richness, wisdom, spirituality.
10. Collect yourself, there is no time to waste. The blue-print of perfect action.

REFERENCES:
The Bhaja Govindam and the Bhagavad Gita.
**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 Saraswati of Bihar School of Yoga, Munger, India.
- “The message of Upanishads” written by Swami Ranganathananda. Published by Bharathiya Vidyavashanam.
- Eight Upanishads with the commentary of Sankaracharya, Translated by Swami Gambhirananda, Published by Adwaita Ashram, Urttaranjal.
- ‘Hatha Yoga Pradipika’ Swami Muktibodhananda, Yoga Publications Trust, Munger, Bihar, India

15ECE111  SOLID STATE DEVICES  3 0 0 3

Unit 1

Unit 2

Unit 3
Direct and indirect recombination - excess carrier lifetime - Steady State Carrier generation - Quasi Fermi levels - Continuity Equation - Haynes Shockley experiment


- Equilibrium PN junctions - Band diagram - built in potential and electric field in space charge region - depletion width - Forward and Reverse Biased PN junction - Ideal Diode equation - Reverse bias breakdown - PN Junction diodes - MOSFET Physics - Threshold voltage - Fundamentals of BJT physics.

TEXTBOOKS:

REFERENCES:

15ECE112  FUNDAMENTALS OF ELECTRICAL TECHNOLOGY  3 1 0 4

Unit 1

Unit 2
Reactance and Impedance - Response in RLC circuits to sinusoidal voltage - Real and Reactive Power - Power factor - Complex Power and Power Triangle: Introduction to Three Phase Systems - Balanced 3-Phase STAR and DELTA connections of Load - Three phase power.

Unit 3
15ECE201  APPLIED ELECTROMAGNETICS  3 1 0 4

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE202  DIGITAL CIRCUITS AND SYSTEMS  3 1 0 4

Unit 1
Introduction to logic families: ECL – TTL - Tri state logic. Implementation technology: Transistor switches - NMOS logic gates - CMOS logic gates - Negative logic systems.

TEXTBOOK:

REFERENCES:

15ECE203  NETWORK THEORY  3 0 0 3

Unit 1
Practice of Mesh Current and Node Voltage analysis of circuits with independent and dependent sources.

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
Unit 3
Field effect transistors: Introduction - Device structure and operation of JFET (Junction Field Effect Transistor) and MOSFETs - I-V characteristics of JFET and MOSFET - MOSFET applications - MOSFET biasing techniques - Analysis of MOS as a switch and as an amplifier - Small signal analysis - Single stage MOS amplifiers (CS, CD, CG) MOS capacitances - MOS high frequency and model and amplifier frequency analysis.

TEXTBOOK:
REFERENCES:

15ECE212  SIGNAL PROCESSING II  3 1 0 4
(Pre-requisite: 15ECE204 Signal Processing I)

Unit 1

Unit 2


Unit 3

Applications of DSP - a few case studies.
5. Design of Adders/Subtractors
6. Design of Multiplexers/De-Multiplexers
7. Design of Encoders/Decoders
8. Study of flip-flops
9. Design of Synchronous counters
10. Design of Asynchronous counters

15ECE282  SIGNAL PROCESSING I LAB.  0 0 2 1

1. Introduction to Matlab
2. Generation of sequences
3. Basic operations on signals
4. Properties of system
5. Convolution
6. Interconnection of systems
7. Frequency response of LTI Systems
8. Frequency domain representation
9. Time shifting property - DTFS
10. LTI System - analysis

15ECE285  DIGITAL SIGNAL PROCESSING LAB.  0 0 2 1

1. Generation of signals
2. Sampling of analog signals and study of aliasing
3. Computation of DFT using direct/linear transformation method
4. Properties of DFT
5. Computation of 2-N point DFT of a real sequence by using an N point DFT just once.
6. Linear filtering using Overlap add/save method
7. Design of FIR filter (different windowing technique)
8. Design of IIR Butterworth filter
9. Applications of DSP - a few case studies

15ECE286  ELECTRONIC CIRCUITS LAB.  0 0 2 1

1. P-N junction Diode and Zener Diode Characterization.
2. Rectifiers with and without filters
3. Clipsers/Clampers
4. Shunt regulator
5. BJT Characterization
6. Single stage CE amplifier
approximations: Bode plots - Introduction to the Nyquist criterion – Stability - Gain margin and Phase margin via Nyquist diagram and Bode plots relation between closed loop transient and closed loop frequency responses - Relation between closed and open loop frequency responses - Relation between closed loop transient and open loop frequency responses - Steady-state error characteristics from frequency response - Systems with time delay - Obtaining transfer functions.

Unit 3
Design via frequency response - Transient response design via gain adjustment - Lag compensation - Lead compensation - The general state - Space representation - Applying the state-space representation - Converting a transfer function to state-space - Converting from state-space to a transfer function.

TEXTBOOK:

REFERENCES:

15ECE304 MICROPROCESSOR AND MICROCONTROLLER 3 1 0 4
(Pre-requisite: 15ECE202 Digital Circuits and Systems)

Unit 1

TEXTBOOKS:

REFERENCES:

15ECE311 DATA COMMUNICATION AND NETWORKS 3 0 0 3

Unit 1
Data Communication Concepts - Networks and open system standards - OSI reference model - Network layered architecture - Network topologies and the physical layer - Bus/Tree topology - ring topology, star topology - Transmission media and technologies.

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE312 DIGITAL COMMUNICATION 3 1 0 4

(Pre-requisite: 15ECE301 Communication Theory)

Unit 1

Unit 2
Digital Transmission through band limited channels - Signal design for band limited channels - Probability of error for detection of digital PAM - System design in the presence of channel distortion.

TEXTBOOKS:

REFERENCES:

15ECE314  COMPUTER SYSTEM ARCHITECTURE  3 0 0 3
(Pre-requisite: 15ECE202 Digital Circuits and Systems)

Unit 1
Introduction to computer system - Brief history of computer systems - Fixed point arithmetic – Addition – Subtraction - Multiplication and division - Booth’s algorithm - Non-restoring division algorithm - Floating point arithmetic. Various addressing modes and designing of an Instruction set.

Unit 2
Data path and controller design - Introduction to CPU design - Processor organization - Execution of complete instruction - Design of control unit - Microprogrammed control unit.

Unit 3
Memory and system organization - Concepts of semiconductor memory - CPU-memory interaction - Organization of memory modules - Cache memory and related mapping and replacement policies - Virtual memory. Introduction to input/output processing: Programmed controlled I/O transfer - Interrupt controlled I/O transfer - DMA - Secondary storage and type of storage devices - Introduction to buses - Introduction to RISC and CISC paradigm - Design issues of a RISC processor and example of an existing RISC processor - Introduction to pipelining.

TEXTBOOKS:

REFERENCES:

15ECE315  BIOMEDICAL INSTRUMENTATION  3 0 0 3

Unit 1
Cell resting potential and action potentials - Origin of bio potentials - characteristics – Frequency and amplitude ranges - ECG – Einthoven’s triangle – 3 lead ECG

REFERENCE:

REFERENCES:

15ECE320  ACTIVE FILTER DESIGN  3 0 0 3
(Pre-requisite: 15ECE303 Linear Integrated Circuits)

Unit 1
Introduction to Active Filtering - Categories of Filters - LP, HP, BP, BE and All Pass Filters - Second Order s-domain equations in each case and their pole-zero plots. Filter approximations – Butterworth, Chebyshev, Elliptic and Bessel - Phase and group delay characteristics of approximation functions - Delay equaliser functions - Frequency transformations.
Unit 2
Review of opamp characteristics: Single opamp biquads - First order LP, HP, BP, All pass filters - Biquad topologies - Analysis and design of single opamp Biquads with finite gain. Analysis and design of LP, HP and BP filter with second order response. Use of bridged T network in active Filters - Sensitivity analysis of single opamp filters.

Unit 3
Multiple opamp Filters: KHN (Universal Active Filter) filter, Tom-Thomas biquad - Analysis and design for various categories of filters - Q enhancement and pole frequency error problem - Elementary ideas of compensation.

TEXTBOOK:

REFERENCES:

15ECE321 ADAPTIVE SIGNAL PROCESSING 3 0 0 3
(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1

Unit 2

Unit 3
Least-Mean-Square (LMS) adaptive filters - LMS algorithm, LMS adaptation algorithm - applications, Method of Least Squares - Data windowing, Normal equations and linear least square filters, Recursive least squares algorithm.

TEXTBOOK:

REFERENCES:

15ECE322 ANALOG SIGNAL PROCESSING 3 0 0 3

Unit 1

Unit 2

Unit 3
Switched-Capacitor circuits - MOSFEs as switches - Switched-Capacitor integrators - Switched-Capacitor amplifiers - Unity gain buffer - Non-inverting amplifier - Precision multiply-by-two circuit.

TEXTBOOKS:

15ECE323 AVIATION ELECTRONICS 3 0 0 3

Unit 1
Introduction to avionics - Systems design parameters and specifications - Traceability - Iiities - Avionics architecture - LRU/LRM - Backplane standards - Data bus - topologies - word formats - MIL-STD 1553B - ARINC 429 - ARINC 629 - CSDB – FCAD.

Unit 2
Fault diagnosis methodologies - FMEA - FTA - Fault tolerance and recovery - NOTAM - Practical exercises.
SYLLABI

SYLLABI

15ECE325
BIOMEDICAL SIGNAL PROCESSING
3 0 0 3
(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
15ECE326 BIOMETRIC SYSTEMS  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE327 DIGITAL SIGNAL PROCESSORS AND APPLICATIONS  3 0 0 3
(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1
Programmable architecture: Review of digital signal processing concepts - Basic architectural features - DSP communicational building blocks - Bus architecture and memory data addressing capabilities - Address generation unit - Programmability and program execution - Speed issues - Features for external interfacing.

TEXTBOOK:

REFERENCES:

15ECE328 HYPERSPECTRAL IMAGING ANALYSIS  3 0 0 3
(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1

Unit 2
Unit 3

TEXTBOOK:

REFERENCES:

15ECE329 IMAGE ANALYSIS 3 0 0 3
(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1

Unit 2
Image representation and description - Chain Codes - Polygonal approximations using minimum perimeter polygons - Other polygonal approximation – Approaches – Signatures - Boundary descriptors - Regional descriptors - Use of principal components for description- Introduction to object recognition.

Unit 3

TEXTBOOK:

REFERENCES:
Unit 3

TEXTBOOK:

REFERENCES:
**15ECE334 WAVELET - BASED SIGNAL PROCESSING AND APPLICATIONS**  
(Pre-requisite: 15ECE212 Signal Processing II)

**Unit 1**  

**Unit 2**  

**Unit 3**  
Introduction to bi-orthogonal wavelets - Introduction to lifting scheme- Applications of wavelet transform: Image processing - Image compression - De-noising - audio coding - channel coding.

**TEXTBOOK:**  

**REFERENCES:**  

---

**15ECE337 ANALOG AND MIXED CIRCUIT DESIGN**  
(Pre-requisite: 15ECE211 Electronic Circuits)

**Unit 1**  

**Unit 2**  

**Unit 3**  

**TEXTBOOK:**  

**REFERENCES:**  
SYLLABI


15ECE339 APPLICATIONS OF LINEAR INTEGRATED CIRCUITS (Pre-requisite: 15ECE303 Linear Integrated Circuits)

Unit 1

Unit 2
Op-amp Circuits I: Instrumentation amplifiers - Current Sources using opamps - Isolation Amplifiers - Operational transconductance amplifiers (OTA) - Log and anti-log amplifiers - Multipliers - Voltage to frequency and frequency to voltage converters - Phase sensitive detectors (PSD) - Phase locked loops (PLL) - Lock-in amplifiers;

Unit 3
Op-amp circuits II: Voltage references - Low noise current differenting and low power operational amplifiers - Power supply ripple - Voltage regulators - IC protection circuits - Analog to digital converters - Σ-Δ ADC.

TEXTBOOKS:

REFERENCES:

15ECE340 INTEGRATED CIRCUITS FOR BIOLOGICAL SYSTEMS (Pre-requisites: 15ECE303 Linear Integrated Circuits; 15ECE302 Control Systems Engineering)

Unit 1

Unit 2

Unit 3
Design and simulation of ECG Pre-amplifier, High CMRR OP-Amp design, instrumentation amplifier, design and simulation of CMOS filters for low frequency ranges. Advanced process design, fabrication and testing of transistors for analog integrated circuits.

TEXTBOOKS:

REFERENCES:

15ECE344 ANTENNA SYSTEMS AND DESIGN 3 0 0 3

Unit 1

Unit 2
Unit 3
Array of two sources – Pattern multiplication – Linear arrays – Broadside array – Endfire array – Planar arrays.

TEXTBOOK:

REFERENCES:
2. C. A. Balanis, “Antenna Theory – Analysis and Design”, Wiley India, 2000

15ECE345
CELLULAR AND MOBILE COMMUNICATION SYSTEM

Unit 1
Introduction to cellular mobile systems - Basic Cellular System - Cellular communication infrastructure: Cells – Clusters - Cell Splitting - Frequency reuse concept and reuse distance calculation - Cellular system components - Operations of cellular systems – Handoff/Handover - Channel assignment - Fixed and dynamic - Cellular interferences: Co-Channel and adjacent channel and sectorization.

Unit 2
Channel Models: Properties of mobile radio channels - Intersymbol interference - Multipath and fading effects - Interleaving and diversity - Multiple access schemes (TDMA, FDMA, CDMA, SDMA) - Interuser interference - Traffic issues and cell capacity - Power control strategies - Channel assignment - Handoff.

Unit 3
Introduction to modern cellular standards - 2G Architecture such as GSM and CDMA based - 2.5G - GPRS: GPRS and its features - GPRS network architecture - GPRS protocol architecture - GPRS backbone network - 3G standard details such as UMTS - Introduction to LTE.

TEXTBOOKS:

REFERENCES:

15ECE346
DIGITAL TELEPHONY

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15ECE347
INTRODUCTION TO RADAR SYSTEMS

Unit 1
Introduction to Radar: Radar block diagram - Radar frequencies - Applications of radar - Radar range equation - Minimum detectable signal - Receiver noise - Integration of radar pulses Radar cross section of targets - Pulse repetition frequencies and range ambiguities.
Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

Syllabi

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE349 MICROELECTRONIC CIRCUITS
(Pre-requisite: 15ECE111 Electronic Circuits)

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:
15ECE350 MILLIMETER WAVE PERSONAL COMMUNICATION SYSTEM

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE351 MIMO AND MULTICARRIER SYSTEMS

(Pre-requisite: 15ECE312 Digital Communication)

Unit 1
Introduction - Crowded spectrum - Need for high data rates – Multiple input multiple output systems – Multi antenna systems and concepts - Spatial multiplexing - MIMO system model- MIMO system capacity- Channel known to the transmitter - Channel known to the transceiver - Water-pouring principle – Capacity calculation – SIMO - MISO - Ergodic capacity - Outage capacity – Influence of fading Correlation on MIMO capacity - Influence of LOS on MIMO capacity.

15ECE352 MULTIMEDIA COMMUNICATION STANDARDS

Unit 2
Delay diversity scheme- Alamouti space - time code - Maximum likelihood decoding - Maximum ratio combining - Transmit diversity - Space-time block codes - STBC for real signal constellations - Decoding of STBC-OSTBC - Capacity of OSTBC channels - Space-time code Word design criteria – Multiplexing architecture - V-BLAST architecture.

Unit 3
Data transmission over multipath channels - Single carrier approach - Multicarrier approach - OFDM - OFDM generation - Cyclic prefix - Performance of space - Time coding on frequency-Selective fading channels- Capacity of MIMO - OFDM systems - Performance analysis of MIMO-OFDM systems.

TEXTBOOKS:

REFERENCES:
Entertainment networks and high speed modem: Cable TV network - Satellite TV network and Terrestrial TV network. Internet applications - High speed PSTN access technologies. Internet applications and world wide web.

**TEXTBOOK:**

**REFERENCES:**
4. ACM transaction on multimedia computing.

**15ECE353**  
**OPTICAL COMMUNICATION**  3 0 0 3  
(Pre-requisite: 15ECE301 Communication Theory)

**Unit 1**

**Unit 2**

**Unit 3**
Link design - System degradation and power penalty - Measurements on fiber optic systems – SONET – EDFA - WDM components and networks.

**TEXTBOOK:**

**REFERENCES:**

**15ECE354**  
**PRINCIPLES OF RFID DESIGN**  3 0 0 3

**Unit 1**
Introduction to RFID - Comparison with other identification systems - Operating and physical principles. Types of tags - Passive, active, semi-passive, security issues, memory capacity - Radio regulatory issues and frequency ranges. Challenges in deployment-cost comparison of tags and readers in India.

**Unit 2**

**Unit 3**
Case studies - Smart cards - Public transport - Payment systems - NFC Applications - Electronic passport - Ski Tickets - Access control - Online and offline Systems - Supply chain and transport systems - Container transport animal identification - Stock keeping - Industrial and medical applications.

**TEXTBOOK:**

**REFERENCES:**

**15ECE355**  
**RADIO FREQUENCY CIRCUIT DESIGN**  3 0 0 3  
(Pre-requisite: 15ECE402 Radio Frequency Engineering)

**Unit 1**

**Unit 2**
**Unit 3**

RF System Design: Impedance matching concepts – Microstrip matching – Transistor biasing networks – Amplifier design concepts and power relations – Design of portable systems.

**TEXTBOOK:**

**REFERENCES:**

---

**15ECE356 SATELLITE COMMUNICATION**  
(Pre-requisite: 15ECE301 Communication Theory)

**Unit 1**
Review of Microwave Communications - Overview of satellite communications - Satellite orbits - Orbital mechanics and effects - Kepler’s laws - Configurations of various orbits - Orbital elements - Elevation and azimuth angles - Doppler effect - Effect of the sun and moon - Sun transit outage. Satellite link models and design - Satellite system parameters - Link budget design.

**Unit 2**
Satellite subsystems – AOCS - TTC&M - Power and communication subsystems - Computations and controlling by processors - Satellite multiple access schemes – FDMA - TDMA and CDMA - Spread spectrum concepts - Comparison of multiple access schemes.

**Unit 3**

**TEXTBOOK:**

**REFERENCE:**

---

**15ECE357 SOFTWARE DEFINED RADIO**  
(Pre-requisite: 15ECE312 Digital Communication)

**Unit 1**
Convergence of signal processing and communication engineering - Introduction of Software Defined Radio (SDR) - reconfigurability - Advantages of SDR over conventional radio – SDR architecture - Implementation. RF Implementation and front ends – Flexible RF system.

**Unit 2**

**Unit 3**
Parameters of Data converters, ADC and DAC architectures- Digital hardware choices – Case studies - Demonstration of SDR coupled to GNU radio.

**TEXTBOOK:**

**REFERENCES:**

---

**15ECE358 SPREAD SPECTRUM COMMUNICATION**  
(Pre-requisite: 15ECE312 Digital Communication)

**Unit 1**

**Unit 2**
Synchronization issues for spread-spectrum - Phase lock loop - Delay lock loop - Acquisition of spreading sequences – Serial search acquisition - Introduction to code tracking.
Unit 3
Detection of spread spectrum signals - Performance of direct sequence spread spectrum - Performance of frequency hopped spread spectrum - Performance of spread spectrum system with forward error correction. Low probability of detection - Code division multiple access (CDMA).

TEXTBOOK:

REFERENCES:

15ECE359 WIRELESS COMMUNICATION 3 0 0 3
(Pre-requisite: 15ECE312 Digital Communication)

Unit 1
Introduction to wireless communications - Large scale path loss - Free space propagation model - Two ray model - Practical link budget design – Outdoor and indoor propagation models. Small scale multi path propagation - Impulse response model of a multi path channel - Parameters of mobile multi path channels - Types of small scale fading.

Unit 2

Unit 3

TEXTBOOKS:

15ECE364  DIGITAL IC DESIGN  3 0 0 3
(Pre-requisite: 15ECE202 Digital Circuits and Systems)

Unit 1
Fast Adders: Hybrid adders, Carry save adder, Kogge-stone and Brent-Kugg adders. Multiplier: Booth, Booth recoded and Wallace tree implementation; Data Representation: Decimal representation – Alphanumeric representation – Fixed point representation – Floating point representation; Fixed point Arithmetic: Hardware implementation and hardware algorithm for fixed point Addition – subtraction, Multiplication and division with signed magnitude data; Floating point arithmetic: Hardware implementation and hardware algorithm for floating point addition – subtraction, multiplication and division with signed magnitude data.

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15ECE365  ELECTRONIC SYSTEM LEVEL DESIGN AND VERIFICATION  3 0 0 3
(Pre-requisite: 15ECE313 VLSI Design)

Unit 1
Electronic system level design: Languages (C++, Verilog and SystemC) - Flows and methodologies – Architecture exploration, Models for system level design and functional Simulation,

15ECE366  EMBEDDED SYSTEMS  3 0 0 3
(Pre-requisite: 15ECE304 Microprocessor and Microcontroller)

Unit 1

Unit 2

Unit 3
ARM cortex M3 processor: ARM processor - ARM cortex M3 architecture - NXP LPC214x On chip Peripherals: A/D converters, PWM, Timer/Counter, UART and its Interfacing- Application development using Keil IDE.

TEXTBOOKS:
REFERENCES:

15ECE367 HARDWARE SECURITY AND TRUST 3 0 0 3
(Pre-requisite: 15ECE202 Digital Circuits and Systems)

Unit 1
Background on VLSI testing – Test generation - Structured DFT techniques overview – Scan design - Boundary scan method – BIST schemes - Hardware trojan – Trojan taxonomy - Case study - Trojan detection – Classification of trojan detection - Challenges in trojan detection.

Unit 2

Unit 3
Security and testing – Scan-based testing – Scan-based attacks and counter measures - System-on-chip test infrastructure - Emerging areas of test security. Trojan prevention: Built-in self authentication - BISA structure and insertion flow - Analyzing BISA structure - Trusted design in FPGAs.

TEXTBOOK:

REFERENCE:

15ECE368 INTRODUCTION TO SOFT COMPUTING 3 0 0 3

Unit 1
Overview of Artificial Neural Networks (ANN) - Models of a neuron - Network architectures - Bayes theorem - Naïve Bayes classifier - Rosenblatt’s Perceptron - Perceptron convergence theorem - Multilayer Perceptrons - Back propagation - Application of ANN in Classification and Regression - Classifier performance measures - Validation techniques.

TEXTBOOKS:

REFERENCES:

15ECE369 PRINCIPLES OF VLSI TESTING 3 0 0 3
(Pre-requisite: 15ECE313 VLSI Design)

Unit 1

Unit 2

Unit 3
**SYLLABI**


**TEXTBOOK:**

**REFERENCES:**

**15ECE370 RISC PROCESSOR DESIGN USING HDL 3 0 0 3**

**Unit 1**
Fundamental techniques of computer design: RISC and CISC architectures - Computer arithmetic - Comparison of RISC and CISC architectures. Verilog: Introduction and review of basic designs using verilog. MIPS processor: Introduction to MIPS features - MIPS instruction set - Logical design of MIPS data path - Control unit and instruction decoder.

**Unit 2**
Design of single cycle - Multicycle and pipelined architectures of MIPS. Introduction to superscalar - Super pipelined architectures - Performance evaluation of super scalar processors. Verilog design of a pipelined MIPS processor.

**Unit 3**
Introduction to memory hierarchy: Cache memory fundamentals - Memory systems for superscalar processors. Static timing analysis: Introduction - Setup and hold time constraints - Processor timing issues - Design examples.

**TEXTBOOK / REFERENCES:**

**15ECE371 VLSI FABRICATION TECHNOLOGY 3 0 0 3**

**Unit 1**
Brief History of Semiconductor technology, Scaling Trends and Scaling Methodologies, Scaling Challenges, ITRS Roadmap; Starting material, silicon structure and properties.

**SYLLABI**


Czochralski and Float Zone crystal growth, GaAs growth; Silicon oxidation methods and properties, Deal Grove Model, Photolithography – masks, pattern transfer techniques, minimum resolvable feature sizes, UV sources, photoresists.

**Unit 2**
Diffusion and ion implantation, Types of diffusion, Ficks laws, junction depth, Stopping mechanisms, Gaussian implantation profile, variations to predicted distribution, implantation damage and annealing; Deposition requirements and techniques – Physical and Chemical Vapor deposition, Epitaxial growth techniques; Wet and dry etching techniques, Etch requirements, Chemical Mechanical Polishing.

**Unit 3**
Interconnect Technology – Copper and Aluminum interconnects, Silicodes, Isolation, CMOS and BJT Process flow; CMOS process for sub-100nm era - dielectrics and gate electrodes, Low K Dielectrics with Cu, Strained silicon, Silicon Germanium, Process Techniques to overcome Short Channel Effects, Nanolithography techniques, Ultra Shallow Junction. Multiple Gate MOSFETs.

**TEXTBOOK:**

**REFERENCES:**

**15ECE372 VLSI DIGITAL SIGNAL PROCESSING SYSTEMS 3 0 0 3**

(Pre-requisites: 15ECE313 VLSI Design; 15ECE212 Signal Processing II)

**Unit 1**

**Unit 2**
Systolic Architecture Design – Fast Convolution – Algorithmic Strength Reduction in Filters and Transforms – Pipelined and Parallel Recursive and Adaptive Filters.
Unit 3

TEXT BOOKS / REFERENCES:

15ECE373  VLSI SYSTEM DESIGN  3 0 0 3
(Pre-requisite: 15ECE313 VLSI Design)

Unit 1
Introduction to verilog HDL: ASIC / FPGA design flow – Advantages of HDL – Overview of digital design with verilog HDL. Hierarchical modeling: Basic concepts – Modules and ports. Overview of different levels of abstractions: Gate level modeling – Dataflow modeling – Behavioral modeling – Switch level modeling.

Unit 2

Unit 3

TEXTBOOKS:
REFERENCES:

15ECE377  ECONOMETRICS  3 0 0 3

Unit 1

Unit 2
Unit 3
Option pricing – BS model – Estimation of volatility of a random walk model –
Kernel density estimation and regression – Examples of non-parametric estimation.
Risk measures – Symmetric dispersion measures – Down side risk.

TEXTBOOK:
Education (India) Pvt. Ltd., 2011.

REFERENCES:

15ECE378 FINANCIAL ENGINEERING 3 0 0 3

Unit 1
Cash Flows and Fixed income securities: Investments and markets - Principal and
interest - Present and future values of streams - IRR. Fixed income securities -
Market value for future cash - Bond value - Bond details – Yields – Convexity –
Duration - Immunization. Bond portfolio management - Level of market interest
rates, Term structure of interest-rate theories.

Unit 2
Stocks and Derivatives: Common stock valuation - Present value of cash dividends
- Earnings approach - Value versus price - Efficient markets theory - Technical
analysis. Analysis of financial statements. Derivatives - futures and options
- Black Scholes formula - Utility functions - Applications in financial decision making.

Unit 3
Portfolio analysis and capital market theory; Covariance of returns – Correlation -
Portfolio return - Portfolio standard deviation - Two asset case - Efficient frontier -
Optimum portfolio. Capital market theory- Capital market line - Sample
diversifications to reduce risk - Characteristic line - Capital asset pricing model.
 Arbitrage price theory - Stock performance evaluation.

TEXTBOOKS:

REFERENCES:
**Ethernet principles – Wireless communication principles – Broadcasting versus link**


**Unit 2**


**Unit 3**

Telecommunication project management: Telecommunication design and implementation – Network analysis and design – Sources of projects – Methodology for designing, developing and implementing telecommunication capabilities – Network modeling – Phases of project management.

**TEXTBOOK:**


**REFERENCES:**


---

**15ECE381**  
**CIRCUITS AND COMMUNICATION LAB.**

Electronic circuits
1. Current mirror
2. Amplifier using current biasing
3. Op-Amp characterization
4. Inverting and Non-inverting Amplifier
5. Integrator, Differentiators
6. Schmitt trigger
7. Astablemultivibrator using 555 Timer

---

**15ECE382**  
**MICROCONTROLLER LAB.**

1. ARM Assembly program for Arithmetic and Logical Operations
2. ARM Assembly program for Multi-byte Operations
3. ARM Assembly program for Control Manipulation
4. ARM Assembly program for String Manipulation
5. ARM Assembly program for Thumb Instructions
6. Embedded C Programming using Keil Simulator
   a. Simple C Programs
   b. Port Programming
   c. Peripheral Interfacing – Keypad, Motor, LED etc.

---

**15ECE385**  
**DIGITAL COMMUNICATION LAB.**

1. Pulse Amplitude Modulation and Demodulation
2. Pulse Position Modulation
3. Pulse Width Modulation
4. Amplitude Shift Keying Modulation and Demodulation
5. Frequency Shift Keying
6. Phase Shift Keying
7. Time Division Multiplexing.
8. Sampling and Quantization Using Matlab.
9. Gram Schmidt orthogonalization for vectors Using Matlab

---

**15ECE386**  
**VLSI DESIGN LAB.**

1. Transfer and Output Characteristics of PMOS and NMOS: Measurement of Threshold voltage, β, β and
2. Pass transistor and transmission logic based AND and OR gates: checking “strong” and “weak” ones and zeros.
3. Inverter output response for a given input: Measurement of rise time, fall time, propagation delay, short circuit power and switching power for zero load and a finite capacitance load.
4. Voltage transfer characteristics (VTC) of Inverter: Measurement of mid-point voltage (switching threshold) and noise margin.
5. Realization of CMOS NAND and NOR gates: VTC characteristics and measurement of switching thresholds.
6. Realization of Boolean function: sizing for equal rise time and fall time.
7. Mirror logic based XOR and XNOR gates.
8. Pseudo NMOS based Boolean expression realization: Checking the output swing, input capacitance and short circuit power.
9. Dynamic and Domino logic based Boolean expression realization: Checking charge sharing and monotonicity.
10. Transistor level realization of D Flip-flop with set and reset.

15ECE387 OPEN LAB. 0 1 2 2

The objective of this lab course is to provide opportunities for hands-on experience in the hardware domain to design, develop and realize prototype electronic systems.

15ECE390 / 15ECE490 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 fourth 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.

15ECE401 INFORMATION THEORY AND CODING TECHNIQUES 3 1 0 4
(Pre-requisite: 15ECE301 Communication Theory)

Unit 1
Introduction to Information Theory: Modeling of information sources - source coding theorem - source coding algorithms - modeling of communication channels - channel capacity - bounds on communication.

Unit 2


Unit 3
BCH codes: Generator polynomials in terms of minimal polynomial - Decoding of BCH codes - Reed-Solomon codes - Peterson-Gorenstein - Zierler decoder. Convolutional Codes: Introduction to Convolutional Codes - Basics of Convolutional Code encoding and decoding - Sequential decoding - Viterbi decoding.

TEXTBOOKS:

REFERENCES:

15EC481 MICROWAVE ENGINEERING LAB. 0 0 2 1

Experiments using Klystron, Gunn diode oscillators and study of various microwave components.

Antennas: Measurement and analysis of RF antennas.

15EC495 PROJECT PHASE I 2 cr

- Design development and realization of selected problems and solutions based on ECE domain.
- Review and analysis of state of the artechnology based research and development.
- Industry oriented problems and its solutions.
- Demonstration of working prototype model.
- Preparation of project report in prescribed format.

15EC499 PROJECT PHASE II 10 cr

- Design development and realization of selected problems and solutions based on ECE domain.
- Review and analysis of state of the artechnology based research and development.
- Publication oriented academic research.
- Demonstration of working prototype model.
- Preparation of project report in prescribed format.
- Publications in conference/journal approved by the department as the outcome of the project.

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.
SYLLABI


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:
i. The Poplar Field by William Cowper
ii. Telephone Conversation by Wole Soyinka

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

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

Language through Practice: Compilation by Amrita University for internal circulation

15ENG230 BUSINESS COMMUNICATION 1 0 2 2

OBJECTIVES: To introduce business vocabulary; to introduce business style in writing and speaking; to expose students to the cross-cultural aspects in a globalised world; to introduce the students to the art of persuasion and negotiation in business contexts.

Unit 1 Business Vocabulary - Writing: Drafting Notices, Agenda, and Minutes - Reading: Business news, Business articles.

Unit 2 Writing: Style and vocabulary - Business Memorandum, letters, Press Releases, reports – proposals – Speaking: Conversational practice, telephonic conversations, addressing a gathering, conducting meetings.

Unit 3 Active Listening: Pronunciation – information gathering and reporting - Speaking: Cross-Cultural Issues, Group Dynamics, negotiation & persuasion techniques.

Activities
Case studies & role-plays.

BOOKS RECOMMENDED:

15ENG231 INDIAN THOUGHT THROUGH ENGLISH 1 0 2 2

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:

15ENG232 INSIGHTS INTO LIFE THROUGH ENGLISH LITERATURE 1 0 2 2

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
SYLLABI


**Unit 2 Short Stories**

**Unit 3 Prose**

Practicals:
Role plays: The Proposal, Chekov / Remember Caesar, Gordon Daviot / Final Solutions, Mahesh 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 1 0 2 2**

**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:**

---

**15ENG234 INDIAN SHORT STORIES IN ENGLISH 1 0 2 2**

**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 3 0 0 3**

**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 (Hotspsots) & Protected Area Network,

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:
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, 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: indefinite and negative Article

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.

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

UNIT 4

UNIT 5
Kahani – Premchand: Kafan, Abhilasha, Vidroh, Poos ki rath, Juloos.

BOOKS:
1. Prem Chand Ki Srvashrestha Kahaniyam: Prem Chand; Diamond Pub Ltd. New Delhi
2. Vyavaharik Hindi Vyakaran Anuvad thaha Rachana : Dr. H. Parameswaran, Radhakrishna publishing House, New Delhi

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; Dhunmil ke Anthim Kavitha [Poet-Dhunmil]; 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

BOOKS:
2. Gadya Manjusha: Editor: Govind, Jawahar Pusthakalay, Mathura
15HUM230  EMOTIONAL INTELLIGENCE  2 0 0 2

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: THE GROWTH OF MODERN INDIA  2 0 0 2

Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajasamudra and the Cakravartins – Ramarajya – Yudhishthira’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 – Harisvaradhana; 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
India’s contribution to the world: spirituality, philosophy and sciences
Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabharata; 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, Brihadaranyak Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya’s Arthasastra and Mrichchhakalktam 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:
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 (Ramaraja) – Yudhisthira’s ramaraja; Sarasvati - 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 srenis – states and cities of the Indo-Gangetic plain.

Unit 2
Classical India: 600B.C. – 1200 A.D.
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 Kushan 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 economics: 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.
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:
2.  WHO Report on Adolescent Health: 2010

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

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.
Awaken Children: Conversations with Mata Amritanandamayi
Indian Aesthetics, V. S. Seturaman, Macmillan.
Indian Philosophy of Beauty, T. P. Ramachandran, University of Madras, Chennai.
Web of Indian Thought, Sister Nivedita
Essays on Indian Nationalism, Anand Kumaraswamy
Comparative Aesthetics, Volume 2, Kanti Chandra Pandey, Chowkhamba, Varanasi
The Invasion That Never Was, Michel Danino
Samskara, U. R. Ananthamurthy, OUP.
Hayavadana, Girish Karnard, OUP.
Naga-Mandala, Girish Karnard, OUP.

15HUM237 INTRODUCTION TO SANSKRIT LANGUAGE

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
Schools of Engineering  
Amrita Vishwa Vidyapeetham

SYLLABI  
2015 admissions onwards

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

Project Work / Practical

15HUM239  PSYCHOLOGY FOR EFFECTIVE LIVING  2 0 0 2

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:
1. V. D. Swaminathan & K. V. Kaliappan “Psychology for effective living - An introduction to Health

REFERENCE BOOKS:

15HUM240  PSYCHOLOGY FOR ENGINEERS  2 0 0 2

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:

REFERENCES:

15HUM241  SCIENCE AND SOCIETY – AN INDIAN PERSPECTIVE  2 0 0 2

Unit 1
Introduction
Western and Indian views of science and technology
Introduction; Francis Bacon: the first philosopher of modern science; The Indian tradition in science and technology: an overview.

Unit 2
Indian sciences
Introduction; Ancient Indian medicine: towards an unbiased perspective; Indian approach to logic; The methodology of Indian mathematics; Revision of the traditional Indian planetary model by Nilakantha Somasuvan in circa 1500 AD
Science and technology under the British rule
Introduction; Indian agriculture before modernization; The story of modern forestry in India; The building of New Delhi

Unit 3
Science and technology in Independent India
Introduction; An assessment of traditional and modern energy resources; Green revolution: a historical perspective; Impact of modernisation on milk and oilseeds economy; Planning without the spirit and the determination.

Building upon the Indian tradition
Introduction; Regeneration of Indian national resources; Annamahatmyam and Annam Bahu Kurvita: recollecting the classical Indian discipline of growing and sharing food in plenty and regeneration of Indian agriculture to ensure food for all in plenty.

Conclusion

REFERENCES:
SYLLABI  
2015 admissions onwards

18. The Cultural Heritage of India. Kolkata: Ramakrishna Mission Institute of Culture.

* The syllabus and the study material in use herein has been developed out of a ‘summer programme’ offered by the Centre for Policy Studies (CPS), Chennai at the Indian Institute of Advanced Study (IIAS), Rashtrapati Nivas, Shimla, sometime ago. The same has been very kindly made available to us by Professors Dr M.D. Srinivas (Chairman) and Dr J.K. Bajaj (Director) of the CPS.

15HUM242  
THE MESSAGE OF BHAGAVAD GITA

Unit 1
Introduction: Relevance of Bhagavad Gita today – Background of Mahabharatha.
ArjunaVishada Yoga: Arjuna’s Anguish and Confusion – Symbolism of Arjuna’s Chariot.

Unit 2
Karma Yoga: Yoga of Action – Living in the Present – Dedicated Action without Anxiety over Results - Concept of Swadharma.

SYLLABI  
2015 admissions onwards

Dhyana Yoga: Tuning the Mind – Quantity, Quality and Direction of Thoughts – Reaching Inner Silence.

Unit 3


TEXTBOOKS / REFERENCES:

15HUM243  
THE MESSAGE OF THE Upanishads

OBJECTIVES: To give students an introduction to the basic ideas contained in the Upanishads; and explores how their message can be applied in daily life for achieving excellence.

Unit 1
An Introduction to the Principal Upanishads and the Bhagavad Gita - Inquiry into the mystery of nature - Sruti versus Smrti - Sanatana Dharma: its uniqueness - The Upanishads and Indian Culture - Upanishads and Modern Science.

Unit 2
The challenge of human experience & problems discussed in the Upanishads – the True nature of Man – the Moving power of the Spirit – The Message of Fearlessness – Universal Man - The central problems of the Upanishads – Ultimate reality – the nature of Atman - the different manifestations of consciousness.

Unit 3
Upanishad Personalities - episodes from their lives and essential teachings: Yajnavalkya, Aruni, Uddalaka, Pippalada,Satyakama Jabala, Svetaketu, Nachiketas, Upakosala, Chakrayana Ushasti, Raikva, Kapila and Janaka. Important verses from Upanishads - Discussion of Sage Pippalada’s answers to the six questions in Prasnopanishad.

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, Mylapore.
7. Upanishad Ganga series – Chinmaya Creations

15HUM244 UNDERSTANDING SCIENCE OF FOOD AND NUTRITION

1022

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 foods value addition of 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) 1022

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) 1022

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 1022

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, belavanigeya kiru parichaya Paaribhaashaikha padagalu Vocabulary Building

Unit 2

Unit 3
Mochi – Bharateepriya Mosarina Mangamma – Maasti Venkatesh Iyengar
Kamalaapurada Hotelnalli – Panje Mangesh Rao
Kaanike – B. M. Shree
Geleyanobbanige bareda Kaagada – Dr. G. S. Shivarudrappa
Moodialane – 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 – Aleyuva Mana – Kuvempu Kannada Adyayana Samste
3. Nemi Chandra – Badhuku Badalisabahu – Navakarnataka Publication
4. Sanna Kathegalu - Prasaranga, Mysuru University, Mysuru
5. B. M. Shree – Kannada Bavuta – Kannada Sahitya Parishattu
6. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna Book House (P) Ltd.
7. Dr. G. S. Shivarudrappa – Samagra Kavya – Kamadhenu Pustaka Bhavana

Unit 4 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. 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

OBJECTIVES: To enable the students to plan, draft, edit & present a piece of writing.

Unit 1
Ancient poet trio: Adhyatmaramayanam, Lakshmana Swanthanam (valsa soumitre... mungikidakayal), Ezuthachan - 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.

Unit 4
Literary Criticism: Ithihasa studies - Bharatha Paryadanam - Vyasaante Chiri - Kutikrishna Mararu - Outline of literary Criticism in Malayalam Literature - Introduction to Kutti Krishna Mararu & his outlook towards literature & life.
**SYLLABUS**

**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:**


**MALAYALAM II**

**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**

Anthology of short stories from period 3/4/5: Ninte Ormmayku, M. T. Vasudevan Nair - literary contributions of his time

**Unit 4**

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

---

**SYLLABUS**

**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:**


**CALCULUS AND MATRIX ALGEBRA**

**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

SYLLABI  
2015 admissions onwards

TEXTBOOKS:

REFERENCE BOOKS:

15MAT121  VECTOR CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS  
3104

Unit 1


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 1.1and 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:

REFERENCE BOOKS:

15MAT202  LINEAR ALGEBRA  
2103

Unit 1

Unit 2
Change of basis - Orthogonal complements - Projection on subspace - Least Square Principle. Linear Transformations: Positive definite matrices - Matrix norm and condition number – QR - Decomposition

Unit 3
Linear transformation - Relation between matrices and linear transformations - Kernel and range of a linear transformation - Change of basis - Nilpotent transformations - Similarity of linear transformations - Diagonalisation and its applications - Jordan form and rational canonical form.

TEXTBOOK:

REFERENCES:

15MAT213  PROBABILITY AND RANDOM PROCESSES  
3104

Unit 1
Review of probability concepts - conditional probability - Bayes theorem.

Random Variable and Distributions: Introduction to random variable – discrete and continuous random variables and its distribution functions - mathematical expectations – moment generating function and characteristic function - Binomial, Poisson, Geometric, Uniform, Exponential, Normal distribution functions (moment generating function, mean, variance and simple problems) – Chebyshev's theorem.

Unit 2
Random processes: General concepts and definitions - stationarity in random processes - strict sense and wide sense stationary processes - autocorrelation and properties - special processes – Poisson points, Poisson and Gaussian processes and properties.
Unit 3

TEXTBOOKS:

REFERENCE BOOKS:

OPTIMIZATION TECHNIQUES

Unit 1
Introduction
Optimization - optimal problem formulation, engineering optimization problems, optimization algorithms, numerical search for optimal solution.

Unit 2
Single Variable optimization
Optimality criteria, bracketing methods - exhaustive search method, bounding phase method - region elimination methods - interval halving, Fibonacci search, golden section search, point estimation method - successive quadratic search, gradient based methods.

Unit 3
Multivariable Optimization

TEXTBOOK:
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

15MEC332 ENTERPRISE MANAGEMENT 3 0 0 3

Unit 1


Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15MEC333 FINANCIAL MANAGEMENT 3 0 0 3

Unit 1


Unit 2

Unit 3


Mergers and Takeovers - International trade.

TEXTBOOK:

REFERENCES:
1. Denzi Watson & Antony Head - ‘Corporate Finance- Principles and Practice’ - Pearson Education Asia, - 2002 - 2nd Edition
15MEC411 OPERATIONS RESEARCH 3 0 0 3

Unit 1
Linear programming: Formulations - graphical solutions, simplex method, duality, Transportation model, Assignment model - travelling salesman problem.

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

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.

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 over view 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 2
Bioceramics, Biopolymers, Metals, ceramics and composites in medicine: Properties, applications, suitability & modifications required for certain applications.

Unit 3

TEXTBOOKS AND REFERENCES:
Integration: Newton - Cotes expression for integral, trapezoidal rule, Simpson’s rule, Gauss quadrature method.

Unit 2


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

REFERENCES:
Suresh Chandra, “Computer Applications in Physics”, Narosa Publishing House, New Delhi
M H jiroth 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 its 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 its 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:

REFERENCES:
SYLLABI


TEXTBOOK:

REFERENCES:

15PHY240 ELECTRONIC MATERIAL SCIENCES 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:

SYLLABI


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.


Unit 2
Laser cutting and drilling: Mechanism for inert gas and oxygen-assisted cutting, factors controlling cut quality and kerf width. Laser assisted drilling.

Laser welding: Introduction to laser keyhole welding and contrast with conduction limited welding, applications.

Direct laser fabrication (DLF): Laser sintering & laser rapid manufacturing, comparison with rapid prototyping. Main potential and limitations of DLF for direct fabrication and for the production of novel engineering materials and structures.

Unit 3
Laser forming: Mechanisms involved, including thermal temperature gradient, buckling, upsetting. Applications in alignment and straightening and in rapid production processes.

Scope of application of laser materials processing: focused on industrial application of laser in materials processing including laser welded tailored blanks.

Laser safety: Introduction to safety procedures in the use of lasers, including wavelength effects and laser safety standards.

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: Fick's 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

**REFERENCE:**

**SYLLABI**

**15PHY245 NUCLEAR ENERGY: 3 0 0 3 PRINCIPLES AND APPLICATIONS**

**Unit 1**

Fission and fusion: The fission process, energetic of fission, byproducts of fission, energy from nuclear fuels. Fusion reactions, electrostatic and nuclear forces, thermo nuclear reactions in plasma. Energetics of fusion. Comparison of fusion and fission reactions.

**Unit 2**
Neutron chain reactions and nuclear power: Criticality and multiplication, factors governing the multiplication, neutron flux and reactor power, reactor types and reactor operations. Methods of heat transmission and removal, steam generation and electric power generation, waste heat disposal.

**Unit 3**
Breeder reactors and fusion reactors: The concept of breeding nuclear fuel, isotope production and consumption, fast breeder reactor, breeding and uranium sources. Technical problems in the functioning of fusion reactor, requirements for practical fusion reactors, magnetic confinement, inertial confinement and other fusion concepts. Prospects of fusion power.

Radiation protection and waste disposal: Biological effects of radiation, radiation dose units, protective measures, internal exposure, and radon problem. Nuclear fuel cycle and waste classification, spent fuel storage and transportation, high level waste disposal, low level waste disposal.

**TEXTBOOK:**

**REFERENCES:**
1. David Bodansky, Nuclear Energy: principles, practices and prospects, Springer Verlag
PHOTOVOLTAICS

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


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 design. Organic solar cells.

REFERENCES:
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:
15PHY331  ASTRONOMY  3 0 0 3

Unit 1

Unit 2
Observational Astronomy
Observing the Universe - The classic Newtonian telescope - The Cassegrain telescope - Catadioptric 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:

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.

Concept of quantum confinement and phonon confinement

Unit 2
Tools for characterization:

Nanoscale materials – properties and applications:
Carbon nanostructures – structure, electrical, vibration and mechanical properties. Applications of carbon nanotubes

Unit 3

Nano electronics and nanodevices:
Impact of nanotechnology on conventional electronics. Nanoelectromechanical
systems (NEMSs) – fabrication (lithography) and applications. Nanodevices -
resonant tunneling diode, quantum cascade lasers, single electron transistors –
operating principles and applications.

TEXTBOOKS:
1. Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, Nanoscale Science and Technology,
John Wiley and Sons Ltd 2004.

15PHY335  MEDICAL PHYSICS  3 0 0 3

Unit 1
Ultrasonics - production methods and properties - acoustic impedance - Doppler
velocimetry - echo cardiography – resolution – speckle - ultrasound imaging -
therapeutic use of ultrasound - use in diagnostics of cardiac problems.

X-rays – production – intensity - hard and soft X-rays - characteristic and
continuous X-ray spectrum - attenuation of x-rays by hard and soft tissues –
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 -
radiosotope 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.

Laser physics – characteristics of laser radiation, mode locking - power of laser
radiation - lasers as diagnostic tool - lasers in surgery - laser speckle, biological
effects, laser safety management.

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.

Electrical conductivity: Classical free electron theory – assumptions, drift velocity,
 mobility and conductivity, drawbacks. quantum free electron theory – Fermi energy,
Fermi factor, carrier concentration. Band theory of solids – origin of energy bands,
effective mass, distinction between metals, insulators and semiconductors.

Unit 2
Theory of semiconductors: Intrinsic and extrinsic semiconductors, band structure
of semiconductors, carrier concentration in intrinsic and extrinsic semiconductors,
electrical conductivity and conduction mechanism in semiconductors, Fermi level in
intrinsic and extrinsic semiconductors and its dependence on temperature and
carrier concentration. Carrier generation - recombination, mobility, drift-diffusion
current. Hall effect.

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
Bipolar junction transistor, p-n-p and n-p-n transistors: principle and modes of
operation, current relations. V-I characteristics. Fundamentals of MOSFET, JFET.
Heterojunctions – quantum wells.

Semiconducting devices: Optical devices: optical absorption in a semiconductor, e-
hole generation. Solar cells – p-n junction, conversion efficiency, heterojunction
solar cells. Photo detectors – photo conductors, photodiode, p-i-n diode. Light
emitting diode (LED) – generation of light, internal and external quantum efficiency.

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

TEXTBOOKS:
SYLLABI  
2015 admissions onwards

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.

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.

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 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 nonsilicate 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.
Unit 1

One-dimensional maps: the logistic map, bifurcations in the logistic map, fixed points and their stability, other one-dimensional maps.

Non-chaotic multidimensional flows: the logistic differential equation, driven damped harmonic oscillator, Van der Pol equation, numerical solution of differential equations.

Dynamical systems theory: two-dimensional equilibrium and their stability, saddle points, are contraction and expansion, non-chaotic three-dimensional attractors, stability of two-dimensional maps, chaotic dissipative flows.

Unit 2

Lyapunov exponents: for one- and two-dimensional maps and flows, for three-dimensional flows, numerical calculation of largest Lyapunov exponent, Lyapunov exponent spectrum and general characteristics, Kaplan-Yorke dimension, numerical precautions.

Strange attractors: general properties, examples, search methods, probability of chaos and statistical properties of chaos, visualization methods, basins of attraction, structural stability.

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.

Unit 2

Lyapunov exponents: for one- and two-dimensional maps and flows, for three-dimensional flows, numerical calculation of largest Lyapunov exponent, Lyapunov exponent spectrum and general characteristics, Kaplan-Yorke dimension, numerical precautions.

Strange attractors: general properties, examples, search methods, probability of chaos and statistical properties of chaos, visualization methods, basins of attraction, structural stability.

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.

REFERENCES:
15SAN101  SANSKRIT I

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
Introduction to Sanskrit language, Devanagari script - Vowels and consonants, pronunciation, classification of consonants, conjunct consonants, words – nouns and verbs, cases – introduction, numbers, Pronouns, communicating time in Sanskrit. Practical classes in spoken Sanskrit

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

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.

Unit 2
Ktavatu Pratyaya, Upasargas, Ktvanta, Tumunnanta, Lyabanta.

Three Lakaras – brief introduction, Lot lakara.

Unit 3
Words and sentences for advanced communication. Slokas, moral stories (Pancatantra) Subhashitas, riddles.

Unit 4
Introduction to classical literature, classification of Kavyas, classification of Dramas - The five Mahakavyas, selected slokas from devotional kavyas- Bhagavad Gita – chapter - II verse 47, chapter - IV verse 7, chapter - VI verse 5, chapter - VIII verse 6, chapter - XVI verse 21, Kalidasa’s Sakuntala act IV – verse 4, Isavasyopanishat 1st Mantra, Mahabharata chapter 149 verses 14 - 120, Neetisara chapter - III

Unit 5
Translation of paragraphs 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
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:

SOFT SKILLS II


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.

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.
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

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

**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.

**SYLLABI B. Tech. - Electronics & Commu. Engg. 2015 admissions onwards**

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.

**TEXTBOOKS:**
5. Data Interpretation by R. S. Aggarwal, S. Chand
6. Logical Reasoning and Data Interpretation – Niskit K Sinkha
7. Puzzles – Shakuntala Devi

**REFERENCES:**
3. The BBC and British Council online resources
4. Owl Purdue University online teaching resources
5. www.thegrammarbook.com - online teaching resources
6. 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:

15SWK231 WORKPLACE MENTAL HEALTH 2 0 0 2


Unit 2 Mental Health Issues in the Workplace: Emotions, Common emotions at the workplace, Mental Health issues - Anger, Anxiety, Stress & Burnout, Depression, Addictions – Substance and Behavioural, Psychotic Disorders - Schizophrenia, Bipolar Disorder, Personality disorders. Crisis Situations - Suicidal behavior, panic attacks, reactions to traumatic events. Stigma and exclusion of affected employees. Other issues – work-life balance, Presenteeism, Harassment, Bullying, Mobbing. Mental Health First Aid - Meaning. Case Study, Activity.

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’wmp.tnoirARIO.ca’
6. Mental Health Act 1987 (India) www.mh.org.in/mt.htm
7. Persons with disabilities Act 1995 (India) socialjustice.nic.in
8. The Factories Act 1948 (India) www.caa.in/Image/19ulabourlawshb.pdf

TAMIL I 1 0 2 2

Objectives: To introduce the students to different literature - Sangam literature, Epics, Bhakti literature and modern literature. To improve their ability to communicate with creative concepts, and also to introduce them to the usefulness of basic grammatical components in Tamil.

Unit 1 Sangam literature: Kuruntokai; (2, 6,8,40 pāṯalkal) – ṣaṇṉaṉu (74,112,184,192 pāṭalkaḷ) – tīṅkūṟu (iṇīmāṭ, aṁaiyu)
SYLLABI


Unit 3

Novel: Jeyakumari “kurukkum”
Essay: Aṭṭaḷ “ē tāḷna tamḻakamē”

Unit 4


Unit 5

Tamil Grammar: Col vakaikal - vēṟrumai urupukal - valliṟṟam mikuniṟṟam
Practical skills: Listening, speaking, writing and reading

Textbooks:
- Aṭṭaḷ “ē tāḷna tamḻakamē” nakkōṭṭu ppālkkēṟṟasī.
- Cūktiṭācchā cuprumoṭṭiyattam “nalla kūṭuntokai mūlumumuraiyum”
- nullai patippakam, 2008.
- jeyakumari “kurukkum” mēkkēḷī puttu ke paḷakam, 1971.
- Poṭṭu maṭtimokkāḷ “aṭṭuṟṟam ilakkaṭam ”aṭṭuṟṟam paḷkkēṭṭi kurīp, vācčiyur, tīṟṟavaṇantarpuram, 2007.
- Puḷiyūr kēḻkkēṭṭ “putumonppu” srveṭṭippāṭi patippakam, 2010

Tamil I

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

The history of Tamil literature: Nāṭṭuppurap paṭṭalkal, kataikkal, paḷamokkakal - cēṟukataikal tōṟṟumum valarcīrum,

Unit 4

Tamil Ilakkaṭam: Vēkkiva vakaikal – tāṟumai ṣīṟavai – nēṟkkōṭṭu avarṟkūṟru

Unit 5

tamil mōli āyvīl kaṇṭhī pyaṟṟpāṭu. - Karuvu purṟmāṭṟum - vilampāra moḷiyanamippu – pēcchu – nāṭakam paṭṭakippu - cēṟkatai, katai, puṭṭakippu paṭṭakkippu

Textbooks:
- Ma Vararotēṟṟa “tamil Ilakkaṭam vavaiṭṭu” cēṟkēṭṭa akōṭṭi paḷkkēṟṟasī, 2017

Schools of Engineering Amrita Vishwa Vidyapeetham S 163

Schools of Engineering Amrita Vishwa Vidyapeetham S 164